The Electrical Industry's Weekly Magazine November 28, 1960

Electrical World

Price 50 Cents

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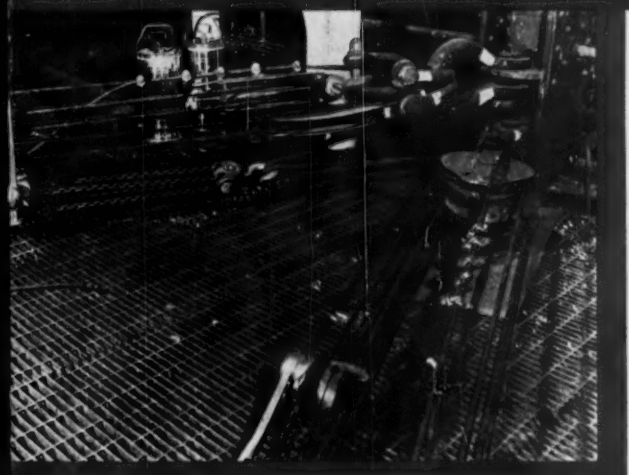
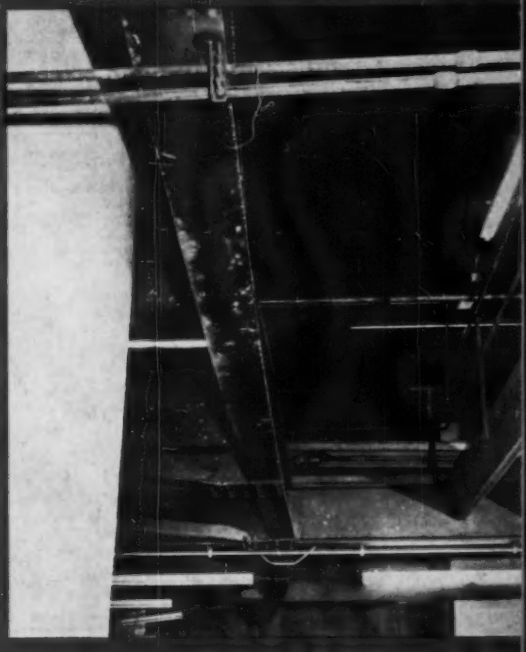
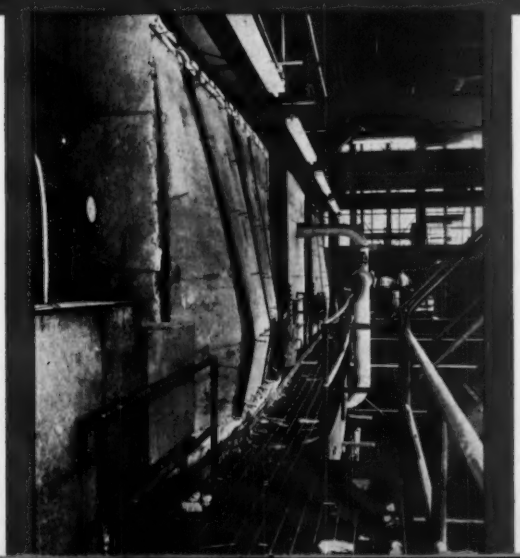




Cold Pull Straightens Columns Bent by Boiler Blast

...page 58

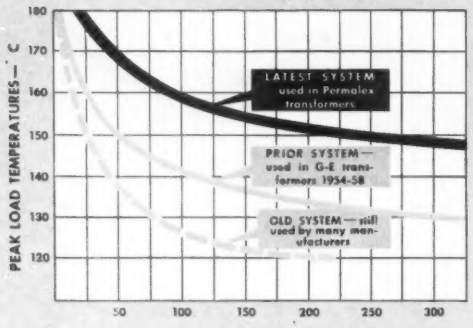


Plan Capacity Together, AEIC Urged...page 54

UNIV MICROFILMS INC
EDITORIAL DEPT
313 N FIRST ST

How General Electric Helps Keep Distribution Transformer

PRICES DOWN, VALUES UP *through...*



LATEST PRODUCT of General Electric research—Permalex transformers—have longer life and increased loadability, at no extra price.

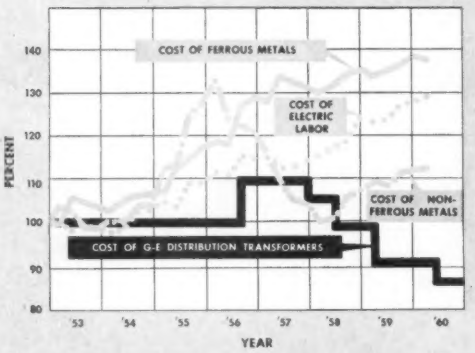


CHART DRAMATIZES General Electric's success in holding down prices. While labor and material costs have steadily risen, G-E distribution transformer prices are actually lower than in 1953.

INNOVATIONS

. . . developed in response to utility needs for improved performance and reduced costs. Part of the money you pay for each G-E distribution transformer goes into the research and engineering through which General Electric continuously improves the transformers you buy. Innovations such as Permalex* transformers with Melalast finish, for example, result in reduced operating costs for you.

LOAD BUILDING

. . . through mutual efforts. General Electric has long been a leading supporter of electric utilities' efforts to bring America the benefits of electric power. These efforts accelerate load growth, creating a need for more and larger distribution transformers. This increasing demand contributes to lower prices through . . .

MECHANIZATION

. . . in existing and new facilities. General Electric's program of increased manufacturing efficiency through mechanization has resulted in price reductions in 1957, 1958, 1959 and again this year. Mechanization has depended upon your acceptance of . . .

STANDARDIZATION

. . . resulting in fewer ratings. A survey conducted by General Electric revealed that five pole-type ratings—10/11.2, 25/28, 50/56, 100/112, and 167/187 kva—are preferred among utilities across the country. General Electric demonstrated its confidence in utility support of standardization by lowering preferred-kva transformer prices. Cost studies show that this standardization will continue . . .

. . . TO KEEP UTILITIES' TOTAL DISTRIBUTION TRANSFORMER OWNING COST AT THE LOWEST POSSIBLE LEVEL

Significant as this program is, it is only one of the many continuing efforts in distribution, transmission, and generation through which General Electric is helping electric utilities to serve the nation's growing demand for low-cost electric power.

*Trademark of General Electric Co. 604-13

GENERAL ELECTRIC

Published for 86 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Electrical World

NOVEMBER 28, 1960

Vol. 154, No. 22

Electrical
What in the World . . .

Off to one side of *Electrical World's* office is a glass and steel-enclosed space that is called the "squirrel cage" by its four inmates. It is here that names like Bogota, London, Bonn, Melbourne—and hundreds of others—are tossed around with seemingly reckless abandon. It is here that about three reams of typed or printed paper a day converge from virtually every part of the United States and the world. This is the sacred ground of the news department.

At the sending end of this vast amount of source material is a list of 70 correspondents who contact *Electrical World* directly. In addition to this very prolific and capable group, we have the services of the McGraw-Hill World News Bureau, which is comprised of 18 competent reporters in seven major cities in the US, plus its own list of 73 domestic correspondents. The News Bureau also has 21 full time reporters in eight world centers, and still another 73 correspondents in smaller cities in every part of the world.

Just to be certain we are getting a look at everything everywhere, three clipping services send us stories published in newspapers and industry magazines. Still another source, of course, is our own staff of field editors and wandering New York staffers.

This is why, when you crack the cover of your *Electrical World*, you are bound to see some name that will send you to Junior's geography book. If something interesting to the electrical industry is happening—we are there.

Chuck Hochgesang

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GUIDED, POWER-FED AUGER GUARANTEES STRAIGHT HOLES

takes only two controls to put it through its paces

Simplicity of operation is the big difference between the Series EM-2 "Earth-Master" and ordinary hydraulic diggers which require movement of three or four levers to dig a hole of comparable size. Unlike diggers that depend on the derrick for down pressure, the frame-guided EM-2 provides direct digger control — with full power down feed exerting several thousand pounds of pressure. Auger can be reversed, run at low speed for digging or at high speed for spin-off. Installed on a live-boom derrick like the Series PM-20 "Pole-Master" shown, this portable unit provides the power and operating features of a fixed-position digger.

Digger and derrick are hydraulically powered . . . controlled independently to permit digging while pole is suspended, an especially valuable feature where cave-in is possible. Pole can be set just as soon as the hole is dug.

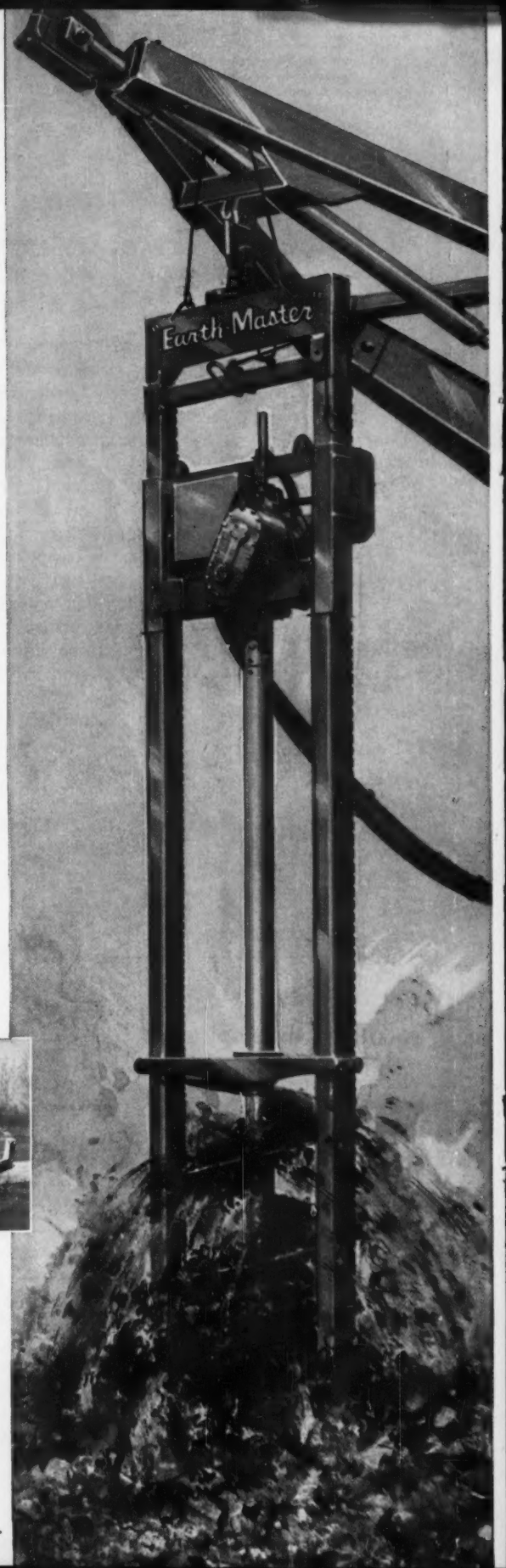
Twin-column telescopic frame, which stows out of the way when derrick is needed for normal hoisting, also serves as a ground prop for pole-pulling and for increased derrick capacity.

SERIES EM-2 "Earth-Master" Hydraulic Hole Digger
DIGS VERTICALLY OR AT ANGLES . . . FROM 9" TO 30" IN DIAMETER, UP TO 10' 6" IN DEPTH

SERIES DF-1 ***"Earth-Master"*** Hydraulically-powered . . . digs to 10'6" deep, 9" to 20" in diameter. Shown above on a Series PM-10 "Pole-Master" Derrick.

another reason why
UTILITIES EXPECT MORE FROM

POWERS American



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Electrical World

Letters

House Heating Formula Queried

To the Editor:

The "Optimum Insulation" article by C. E. Thomas in September 12, *Electrical World*, is indeed encouraging, because of the attention now being given to the computation of how much insulation it pays the consumer to use for electric heating. The compactness of the mathematics used by Mr Thomas also is interesting. However, there are some shortcomings in the examples shown, and in order to avoid misleading impressions these should be brought to the attention of your readers:

1. The saving in first-cost of heating equipment and power wiring is not considered.

2. Apparently an average rather than an incremental cost of insulation is used. (The installed cost of 4¢ per in. per sq ft is more than double the incremental cost of blown ceilings in the Madison area.) Perhaps the author was thinking of insulating old houses, rather than new construction.

3. There is question about the accuracy of the energy-use formula used, as applied to decremental heat loss for electrical heating.

Glydewell Burdick, Secretary
Wisconsin Power & Light Co

▶Following are the author's comments on the letter above:

I am pleased that Mr Burdick has shown an interest in my article.

1. He is correct in indicating that savings in the first cost of heating equipment and power wiring were not considered in the equation. Neither were savings in cooling equipment and operation, nor the matters of increased comfort and reduced sound transmission. It was obviously necessary to limit the analysis to include only the more important considerations. Items such as the first cost of equipment actually depend upon the overall size and the composite construction of the entire building, hence are difficult to relate to one sq ft of any particular component building surface. In order to include such items, the mathematical analysis would be rendered so cumbersome as to lose

(*Continued on page* 102)

Dateline . . .

Jackson, Miss.—Hearings before the Mississippi Public Service Commission on co-op and investor-owned utility territorial rights took an interesting turn as the Mississippi Municipal Assn appeared on the scene with some 30 mayors.

Mississippi Power & Light Co and Capital Electric Power Assn are disputing over an area historically served by the cooperative, but annexed by the City of Clinton—where MP&L has a franchise. The mayors appeared at hearings to defend the right of municipalities to determine who will serve them.

Much of the trouble stems from a "grandfather" clause in the law establishing the PSC just a few years ago. All organizations were provided with certificates of convenience and necessity protecting areas they were serving at the time. As a result, MP&L has a certificate to serve inside the Clinton city limits, and Capital has another to serve outside the city limits.

Further complicating the present issue is an agreement between the two utilities (and approved by the PSC) that even in certified areas, neither the rights of MP&L or Capital were to be affected in any area upon its inclusion in future expansions of city limits.

The City of Clinton, however, contends it has the right to choose which will serve the area.

Capital applied for a franchise and was refused. *Electrical World's* editor at the hearings gathered that reasons for the refusal were probably:

1. Preference for service from MP&L;

2. MP&L already has a franchise;

3. Capital would pay no franchise fee or taxes.

Clinton requested MP&L to put street lighting in the disputed area, and one resident requested the utility's service. Both took place, and Capital asked the PSC for a cease and desist order.

MP&L has offered to buy Capital facilities inside

(*Continued on page* 53)

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WIRE AND CABLE ROUND TABLE

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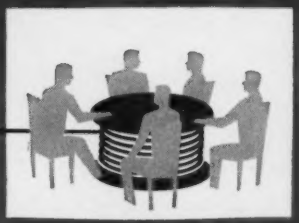

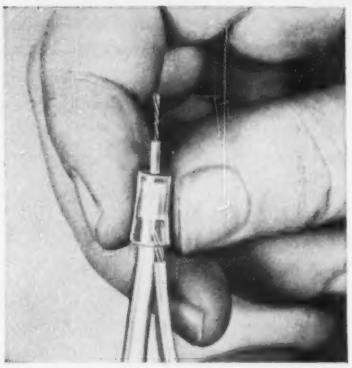

One-piece Burndy connector gives fast, reliable compression

Fast and reliable connections are possible with the one-piece UNIRING, molded of ZYTEL by the Burndy Corp., Norwalk, Conn.

Since these are compression connectors, there is no heat needed, and thus no danger of overheating cable. This also means no slow, bulky solder joints. The completed UNIRING assembly is only a few mils larger than the cable diameter.

UNIRING is available both insulated and uninsulated for single shielded cables, multi-conductor shielded cable and coaxial cables. They are also color coded for easy identification.

The Burndy sheath connectors are another example of the versatility possible with ZYTEL nylon resins. For more information to help you evaluate ZYTEL for your needs, write to the address at the right of this page.

Du Pont does not manufacture wire and cable, but supplies thermoplastic resins to the wire and cable industry.

POLYCHEMICALS DEPARTMENT

DU PONT

Better Things for Better Living...*through Chemistry*

New shipboard control cable uses ZYTEL® for resistance to cut-through, chemicals and moisture.

This naval destroyer, the USS Wilkinson, is equipped with modern, anti-submarine missiles controlled by cables protected with Du Pont ZYTEL nylon resin. (OFFICIAL U.S. NAVY PHOTO)

ZYTEL 33 and 37X help protect the Navy's "MOHOS" cable used to control the Mark 108 rocket launcher on the USS Wilkinson. In this new cable design, each single has a thin secondary insulation of clear ZYTEL 33, plus a tough outer armor of heat and light stabilized ZYTEL 37.

The two layers of ZYTEL are used for several important reasons. The armor protects the entire cable and allows it to be easily pulled through cableways without snagging or skinback. The two layers also provide outstanding resistance to cut-through, moisture and various hydraulic fluids to which the cable is exposed.

Because of the superior mechanical properties of ZYTEL, the jacketing is thinner than other materials could be, reducing the overall cable weight and diameter. The secondary insulation of ZYTEL 33 permits the effective use of watertight terminal lugs to prevent wicking. And its transparency allows easy reading of identification matter printed on the singles.

You may find that the use of ZYTEL nylon resins or other Du Pont wire and cable grade plastics can solve your problems. If you would like more information, consult your wire and cable supplier, or write to the Du Pont Company, Dept. M-1128, Room 2507Z, Nemours Bldg., Wilmington 98, Delaware.

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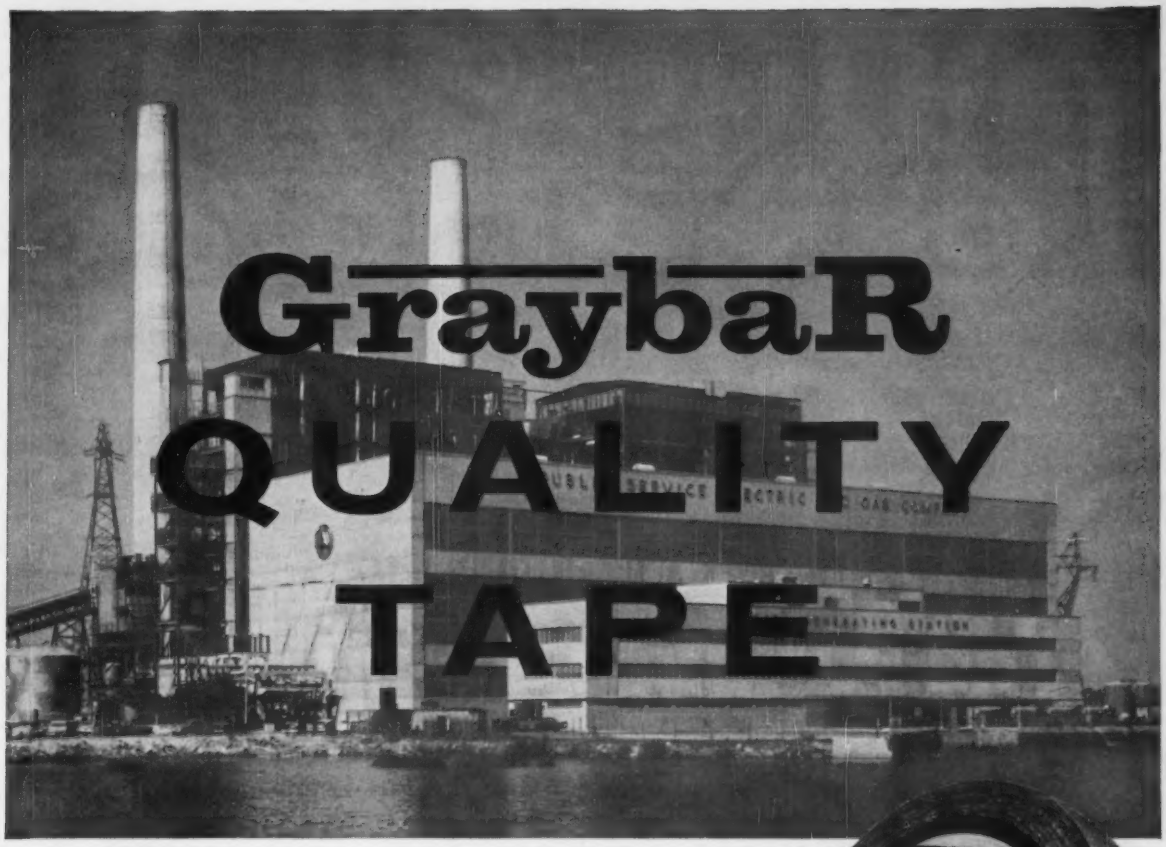

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On your next purchase order — and always — specify the best: Graybar tape!

Have you tried Graybar's new PREMIUM BROWN—

A new high quality brown friction tape for utility use . . . where permanent adhesion, superior insulation and moisture protection are vital. Have you tried it yet?

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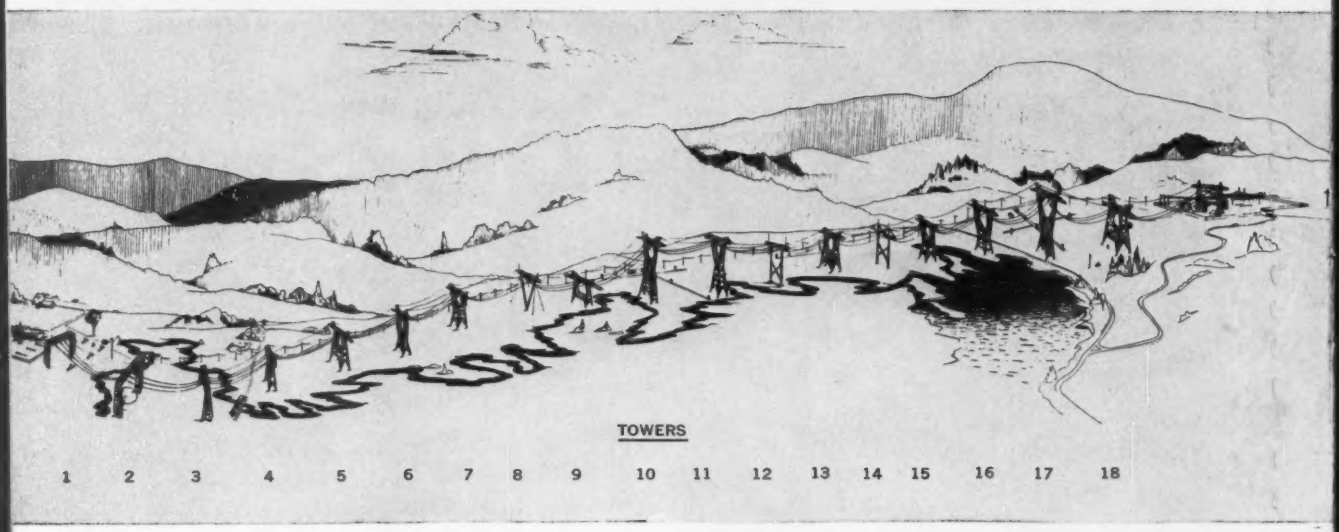


USS High Strength Steels in the push for Extra

Why Project EHV

To help the utility industry find the answers to the complex problems of extra high voltage transmission, General Electric Company has set up a prototype power system not far from Pittsfield, Massachusetts. It's called Project EHV. This new outdoor laboratory will be used to study EHV transmission problems at 460 kv. to 750 kv. The system stretches some 4.3 miles and will eventually become a power carrying segment of the Western Massachusetts Electric Company's system.

Who builds the towers

The line calls for 18 transmission towers. Fourteen of these eighteen will be steel units, eleven of which were designed, and thirteen of which were fabricated by United States Steel.

The first three towers will be of the large portal-type ranging in width from 162 to 184 feet and in height from 78 to 129 feet. These will permit a wide testing range of conductor sizes, spacings and configurations. The other towers are more conventional in their design.

What steels are used

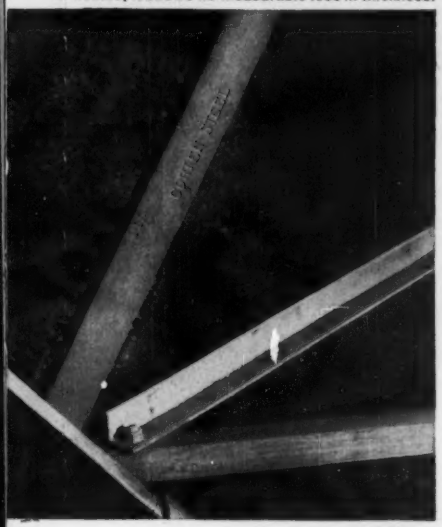
Materials used in Project EHV are extremely important. As in most modern transmission towers, high strength steel will be used in combination with A-7 structural carbon steel.

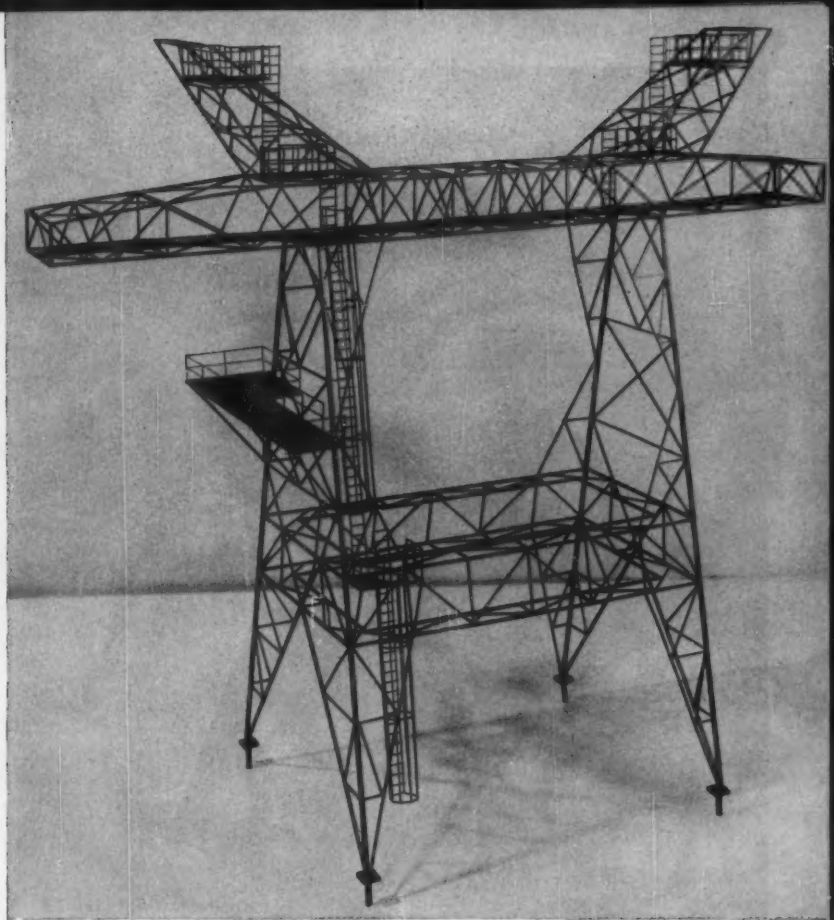
In the three portal towers and eight of the other towers, A-7 galvanized structural carbon steel will be used in some members with USS MAN-TEN High Strength Steel (galvanized) in the highly stressed members. USS MAN-TEN Steel has a minimum yield point of 50,000 psi—about 50% higher than A-7 carbon steel. It also has about double the corrosion resistance. The use of MAN-TEN Steel reduced the tower weight by approximately 12% in the large portal towers.

Watch United States Steel's special Christmas show, **The Coming of Christ,** in Color on NBC-TV, Wednesday, December 21, 8:30 P.M., E.S.T.

This mark tells you a product is made of modern, dependable Steel.

This USS COR-TEN Steel diagonal brace has been in a transmission tower for 12 years in a corrosive industrial atmosphere at U. S. Steel's Gary, Indiana, Works and though the brace has never been painted or coated, it shows no measurable loss in thickness.





Model of Tower 18, designed for Project EHV, that will be built completely from unpainted and uncoated USS COR-TEN High-Strength Low-Alloy Steel.

High Voltages

Tower No. 18 is different. It's the first tower completely fabricated from uncoated USS COR-TEN High-Strength Low-Alloy Steel to be installed in a transmission line. In addition to being 50% stronger than structural carbon steel, COR-TEN Steel is famous for its high atmospheric corrosion resistance—4 to 6 times that of structural carbon steel. As part of this test, the tower will never be painted—thus it has a significant maintenance advantage. The steel forms a tight protective coating against corrosion during the first years of exposure. Therefore, it requires no maintenance. Unpainted and ungalvanized—a new idea that can save any utility untold thousands of maintenance dollars in the future. For more information, write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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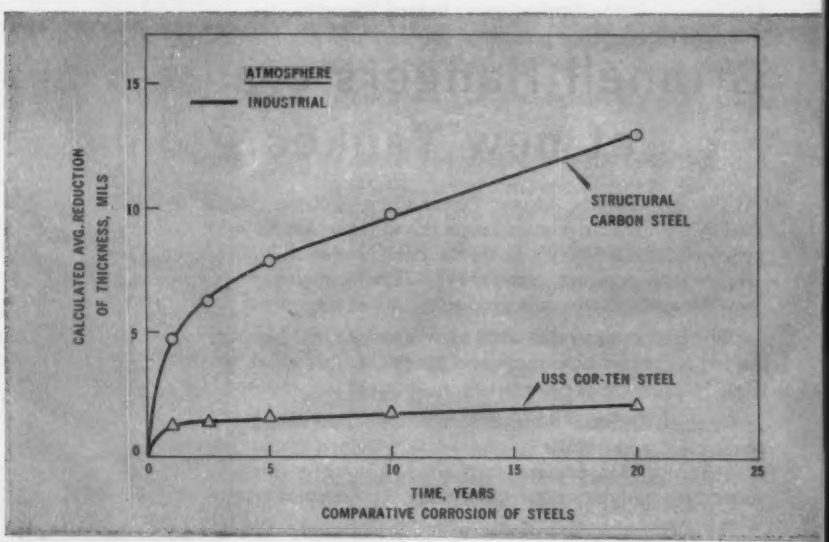
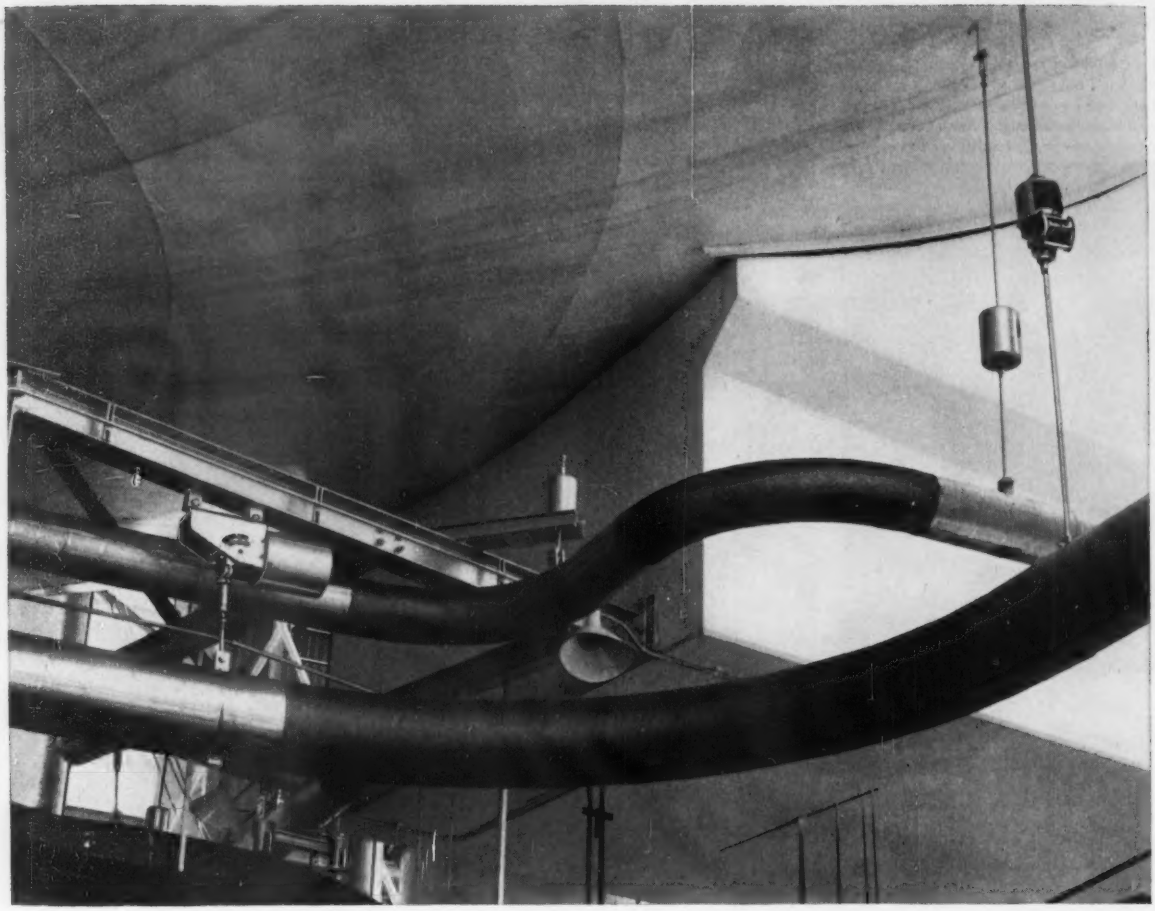


This chart shows that the corrosion loss of USS COR-TEN Steel is only about one-fifth that of structural carbon steel in an industrial atmosphere.

United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel



Grinnell Spring Hangers support the pipes carrying steam from the heat exchangers to the turbines.

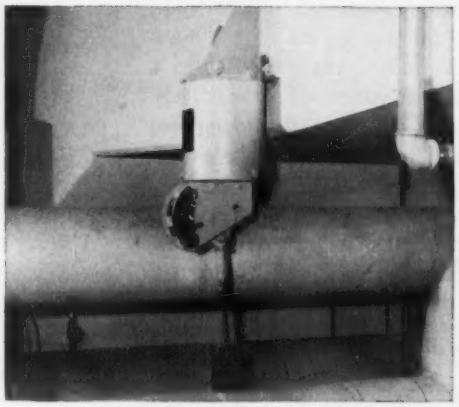
Grinnell Hangers cradle high-pressure piping at new Yankee Atomic Power Plant

At the new Yankee Atomic Power Plant in Rowe, Mass., uranium fuel in the nuclear reactor keeps the water which flows through the reactor at about 500°F. This pressurized water, at 2,000 pounds per square inch pressure, transfers the heat through piping to a steam generator where steam is produced for running power turbines.

Piping that undergoes such high pressures and temperatures must have rugged, *reliable* support. Chosen for this tough job: Grinnell Pipe Hangers!

Grinnell Constant Support Hangers are used where reactive forces at terminal points must be kept within specified limits. Grinnell Variable Spring Hangers are used where piping is subject to vertical movement and does not require a constant support type.

For a complete line of engineered pipe hangers and supports . . . for skilled advice and assistance . . . for experienced field engineering service . . . call on Grinnell Company, Providence 1, Rhode Island.



Turbine extraction lead gets support from Grinnell Constant Support Hanger

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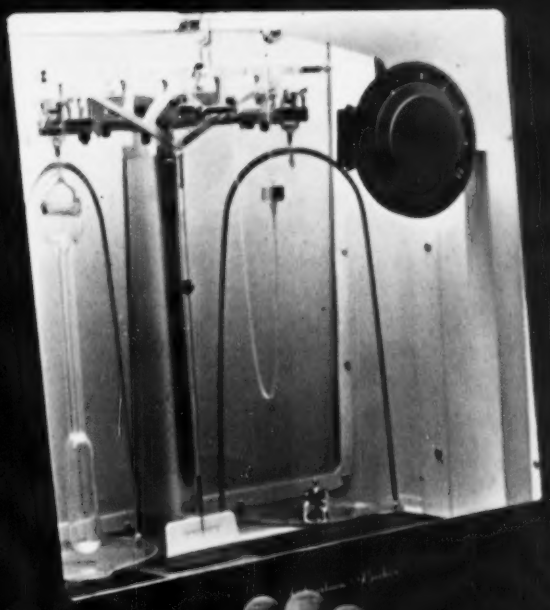


the Policy...

Our business is more than the production of transformers. It is to provide SOLUTIONS TO transformer PROBLEMS.

Our objective is to demonstrate that—Moloney Electric Company provides flexible, expert and prompt service in finding solutions to specific problems of transformation—solutions that:

- Answer the needs of changing and growing utility loads.
- Keep transformation costs, including installation and maintenance, below the upward trend of general cost increases.
- Eliminate every possible element of economic waste.
- Give every person responsible for transformer purchase or performance an assurance of standards he can count on. To make each person say to himself, "I want Moloney to assist in solving my transformation problems."

This policy and our experience, resources and personnel make Moloney Electric uniquely qualified to serve utilities in every phase of transformation research, development, design and production.

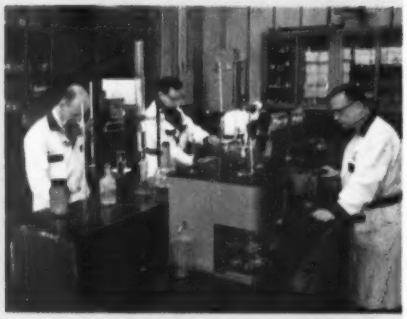
MOLONEY ELECTRIC

Research and Development at Moloney:

The manpower and expense budget for research and development at Moloney is not assigned on a predetermined percentage-of-sales or other formula. The resources in men and money for this essential work are determined in the light of our fundamental policy to lead in transformer improvement and to achieve specific results for customers with particular problems.

Five standing committees of key management and technical executives—including a Program Direction Committee, of which the President and Chairman of the Board are members—set specific and practical goals for research and development projects and keep problems and progress under constant review.

the people . . .



The people of our Research and Development Department are the nation's most specialized technical group in the transformation field. A staff of graduate electrical, mechanical and chemical engineers—specialists in every phase of transformation technology—is constantly employed in engineering design, research and development.

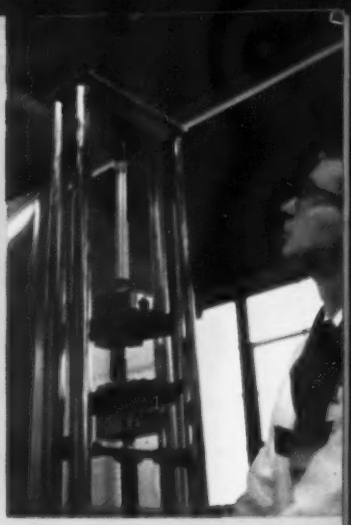
The consultant services of the nation's ablest independent experts, both academic and industrial, in every phase of theoretical and applied research relating to electricity are continuously available to Moloney staff researchers. These experts are on year-round retainer and are present in the Engineering Department on a regular basis.

MOLONEY

Manufacturers of Transformers

SALES OFFICES IN ALL PRINCIPAL CITIES

the problems . . .



Every theoretical or practical idea that appears to be related to better transformation is subject matter for thorough, constant and programmed study: chemical compatibility of materials, magnetics, electrical characteristics, insulation, heat transfer, sound, mechanics —in all these and other fields, systematic investigations and experiments—keyed directly to transformer performance—lead to improved transformation through better materials and better design.

As major electric utilities are, in increasing numbers, setting up their own departments of research and development, Moloney Electric's research is ever more closely geared to specific projects and goals suggested by individual customers.

Moloney Electric's emphasis on the importance of research and development has been recognized by major corporations that produce materials for transformer manufacture. These suppliers work cooperatively with Moloney in research that has produced significant product improvements and now promises a number of basic forward developments.

Contributions of Moloney research people benefit not only customers and suppliers, but the entire electrical industry. Currently we are taking part in the joint AIEE-NEMA program to develop an accelerated, functional, life testing method for distribution transformers, and to establish a new loading guide.

E L E C T R I C C O M P A N Y

for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

Moloney Electric has played a leading role through every important step of progress in transformation. Moloney developed the first three-wire transformer and was the first to use silicon steel for cores. Some of the recent accomplishments of Moloney Electric's research and development programs are . . .

Automatic Testing of Distribution Transformers . . . a patented system eliminating the element of human error from transformer testing.

Corrosion Resistant Tanks . . . made of special aluminum alloys to prevent deterioration of the metal under extreme corrosive conditions.

Moloney Core . . . a new Distribution Transformer core design, reduces losses, exciting current and sound levels.

Corrugated Network Tanks . . . the first continuously corrugated network transformer tanks.

Duratherm Insulation . . . a new high temperature insulation permits operation at increased KVA, or increases transformer life expectancy.

SR New Core Steel . . . the application of a special new core steel makes possible a significant reduction in power transformer sound levels.

"Distributionized" Power Transformers . . . 15 KV, 3 phase transformers, 1500 KVA and below, designed using distribution BIL and without the usual accessories. The result is a smaller, lighter transformer without a sacrifice in performance or overload capabilities.

138 KV Terminal Chamber . . . a special two-compartment terminal chamber to terminate high pressure pipe type cable and positively isolate cable oil from the transformer in the event of a cable leak.

Double-Circuit Integrated Substation . . . a complete substation assembly including LV switching equipment, LTC, line dead-ending provision, etc., for economically serving outlying areas.

Unitran . . . single and three phase pad-mounted transformers for use on underground distribution systems.

Reactor By-pass Switching . . . an exclusive, patented LTC principle affording savings in maintenance and operating expenses.

All-aluminum Power Transformer . . . a 3750 KVA unit having all metal components, except the core, made of aluminum.

Duracoat . . . a new, weather resistant, high dielectric coating for distribution transformer covers.

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA
SALES OFFICES IN ALL PRINCIPAL CITIES

ME60-25 LITHO IN U. S. A.

Electrical World

NOVEMBER 28, 1960

Vol. 154, No. 22

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PEAKING REPORT—Don't miss this 16-page, two-color report on the four major sources of peaking power and the problems involved in applying them to power systems.

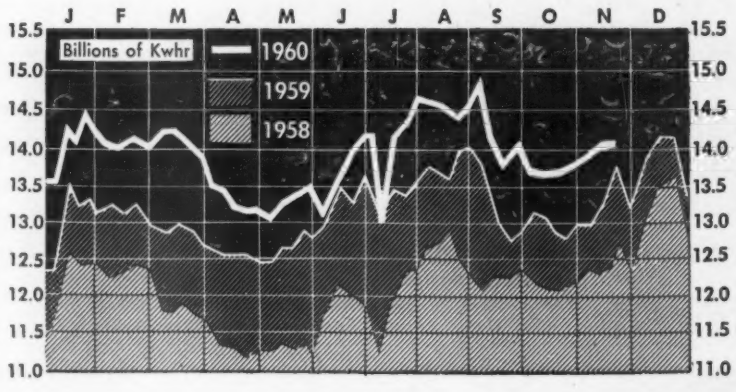
LATE NEWS ▶ **Pennsylvania PUC orders formal investigation** of Pennsylvania Power Co's rates after utility declines to make voluntary reductions for 87,000 customers in five counties. Action is first formal inquiry since PUC started to look at state utility earnings. Last March, PUC allowed the utility a $484,000 annual rate boost (about 35% of that requested) on the basis of a 5.9% return.

"Not serious" is Commonwealth Edison's analysis of a break in the tube connecting one of 80 control rods to its drive mechanism at Dresden Nuclear Power Station. Upon indication of the break, the plant was shut down. A spare drive mechanism was installed and connected to the original control rod. Unless the opportunity is taken to inspect the opened reactor, the station will be ready to resume operation this week. Dresden has been operating at better than 70% load factor during the last four weeks . . . **Additional tests** on Northern States Power Co's Pathfinder plant are recommended by AEC's Advisory Committee on Reactor Safeguards. Reason—to determine the safety of the integral superheater design. Although the Committee doubts the reactor is an undue hazard, it points out that there has been no experience with fuel elements designed for this reactor.

All-electric homes with 240-480-v underground service are being provided for employees who will operate Texas Electric Service's new 240-Mw plant. The 15-home project, called Graham Village, will be served by one 100-kva transformer, with a 2-kva, 240-120v dry transformers in each house. All major appliances and fluorescent lighting will be served at 240 v. Various combinations of central and unit heating and cooling equipment will allow TESCo to make detailed studies of the usage and benefits of all-electric living.

Federal Judge J. Cullen Ganey now holds the key to an out-of-court settlement of the 20 antitrust indictments against the electrical manufacturing industry. The settlement, proposed by Westinghouse Electric Corp and General Electric Co, would consist of the companies pleading guilty on the seven most serious indictments in return for being allowed to plead *nolo contendere* on the other 13. Last week, Judge Ganey heard arguments for *nolo* from companies named in six out of the seven, but not from GE and Westinghouse. If he bars the *nolo* pleas, then GE and Westinghouse will plead guilty; otherwise, they will probably plead not guilty and court trials would result. The judge will decide on the *nolo* pleas within the week. Meanwhile, the power switchgear trial is indefinitely postponed.

WEEKLY POWER OUTPUT—Up 1.7% (Week ending Nov. 19), Kwhr 14,042,000,000



Per Cent Change From Previous Year

	Nov. 5	Nov. 12	Nov. 19
Total U. S.	+ 7.4	+ 6.3	+ 1.7
New Eng.	+ 5.7	+ 5.6	+ 1.2
Mid. Atlan.	+ 6.5	+ 3.8	− 0.5
Cent. Indust.	+ 7.7	+ 4.6	− 1.6
West Cent.	+ 7.7	+ 5.2	+ 0.8
Southeast	+ 7.0	+ 9.8	+ 4.2
South Cent.	+ 5.3	+ 8.3	+ 7.3
Rocky Mount.	+13.4	+17.2	+11.1
Pacific			
NW	+ 7.1	+ 3.1	− 1.8
SW	+ 9.9	+ 5.7	+ 4.5

Seasonally Adjusted Index 269.7
Week Ago 272.9 Year Ago 254.1

Source: Edison Electric Institute

Supply Lines

MORE UNDERSTANDING NEEDED BETWEEN MANUFACTURERS, UTILITIES

Top utility executives agree on the need for healthy, vigorous suppliers, capable of furnishing research and development to improve the equipment and products required in utility operations. But these same executives have widely differing views on the present state of the equipment market, price levels, and the cause of price declines. This appraisal emerges from talks and correspondence with a score of electric utility presidents and board chairmen around the country. A part of it comes in response to the series of Management Newsletters (EW, Sept. 5, 12, and 19) discussing the equipment market and the antitrust cases.

While most of these top men are well aware of substantial price declines on many items of electrical equipment, they are not fully convinced that present prices are "too low." Some do suspect that current price levels may have an adverse effect on research and development efforts, and a few report that extra services are being eliminated or curtailed by manufacturers. There seems to be more inclination to trace price declines to weak demand and a generally listless business situation than to the antitrust suits brought against many electrical manufacturers.

Suggestions for strengthening the electric equipment market came from a number of these top utility men. Here are some samples:

- "We concur in the advantages to be derived from a more thorough understanding of the motivations of the manufacturers, and of the habits and policies of utility purchasing executives."
- "A wider dissemination of information between manufacturers and utilities should foster a clearer understanding for all parties involved in this issue and help create an element of stability, which does not always exist, in the market prices for electrical machinery, equipment and supplies."
- "The accurate forecasting of economic cycles would permit greater cooperation between the utilities and manufacturers in scheduling orders to make greater capacity utilization of manufacturing facilities and thereby permit lower manufacturing costs. "
- "The utilities could agree on a much greater standardization of generating units than they have been willing to do so far. It would reduce costs considerably. There is a tendency in utilities to ask for a tailor-made unit . . ."
- "It is my impression that it would be mutually advantageous to the manufacturers and utilities if each shared enough market information to permit the manufacturers to schedule production at a more uniform rate."

The need for manufacturers to speak out frankly on pricing philosophy and for utilities to speak out clearly on purchasing policy, while only occasionally expressed, does seem to emerge from talks and correspondence with both utility men and suppliers. From the top men in both fields, there is little bitterness expressed—but there are frequent pleas for understanding on both sides.

PRICES LOWERED ON CABLE; ALUMINUM PRODUCERS TALK INCREASE

Lower prices on leaded paper power cable of the solid type have been announced by Phelps Dodge Cooper Products Corp. The new prices became effective Nov. 7. At the same time, the firm trimmed prices of polyethylene sheathing applied as a protective covering over leaded cables. "We lower our prices reluctantly and

with the sole object of facing up to the increasing attack on our business on the part of foreign manufacturers anxious to enter our market," the company said in a statement explaining the price change. The company added, "There is no justification for our price reduction at this time from the standpoint of recent operating results. On the contrary, rising labor and other production costs, increased cost of expenditures for research and development in this very technical field, and decreasing volume have combined to result in lower net profit."

Meanwhile aluminum producers were talking about a possible price increase. A spokesman for Aluminum Co of America foresaw prices "firming at a higher level in 1961," but he could not say when. But the trial balloon on higher aluminum prices was sent up against a background of some production shutdowns and a price reduction on sheet aluminum. It was plain that it was manufacturing costs, rather than a firm market, that motivated the speculation of higher aluminum prices.

UTILITY PURCHASING MEN HAVE VARIETY OF TITLES

Who's in charge of purchasing? A recent survey by *Electrical World* indicates that the range of titles involved in the purchasing function of electric utility operations is very broad. Responses to our survey showed 23 different titles in investor-owned utilities, 26 in municipal utilities, and 18 in rural electric cooperatives. As the tabulation below indicates, a great many of the persons responsible for purchasing are not directly in a purchasing department.

Major responsibility for purchasing by investor-owned utilities, the survey indicates, rests with a purchasing agent or a director of purchasing. However, the results show that in some companies, the responsibility is also exercised directly by the president or executive vice president and more often by a vice president. For rural electric cooperatives, the manager most often holds the responsibility in this important field. The results in the table below are based on replies from 327 municipals, 175 cooperatives, and 139 investor-owned utilities.

Titles of Individuals in Charge of Purchasing

	Type of Utility		
	Investor-Owned	Municipal	Rural Co-op
Purchasing Agent	49%	12%	13%
Director of Purchasing	11%	1%	
General Manager	2%	2%	8%
Manager	12%	14%	63%
Asst Manager			4%
Vice President	6%		
Secretary Treasurer	4%		
President	4%		
Superintendent		29%	
Superintendent of Utilities		14%	
City Manager		9%	
City Clerk		3%	
Director of Utilities		2%	
Engineer		2%	2%
Other	12%	12%	10%

GROUND-TRIP TIMING PLUGS—sealed solid-state components provide two TCC for ground tripping. Any two may be selected from curves 1, 2, and 3. Field-changed by plugging-in different choice.

OPERATIONS COUNTER—electrically counts each recloser opening.

RESET RELAY—Thermal time-delay relay resets if fault clears. New sequence when a new fault occurs; 9 intervals from 10 to 180 seconds. Field-changed by plugging in different relay.

SEQUENCE RELAY—sequences control circuit.

INSTANTANEOUS RESET-CLOSE—by-passes reset time-delay and closes recloser.

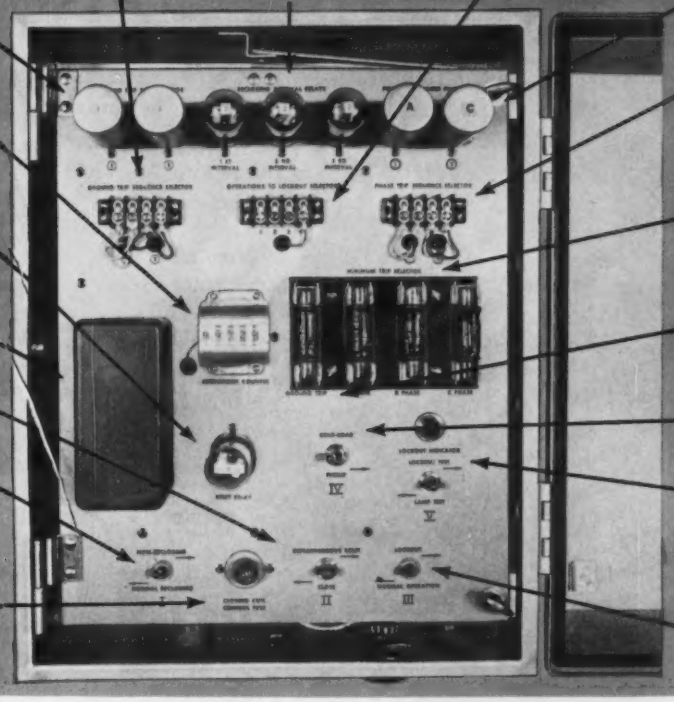
NON-RECLOSING-NORMAL RECLOSING—permits elimination of control sequence. With switch in non-reclosing position, recloser will operate once and lock out.

CLOSING COIL CONTROL FUSE—when line voltage is too low to reclose, fuse blows to prevent operation of closing solenoid coil contactor.

GROUND TRIP SEQUENCE SELECTOR—connections determine the sequence of any two TCC's selected. Field-changed by reconnecting. (OPTIONAL)

RECLOSING INTERVAL RELAYS—thermal relays for intervals between successive reclosings; 8 intervals from ½ to 60 seconds. Field-changed by plugging in new choice.

OPERATIONS TO LOCK-OUT SELECTOR—terminal connection determines number of operations to lockout. Field-changed by reconnecting.



PHASE TRIP TIMING PLUGS—sealed solid-state components, provide two time-current curves for phase tripping. Any two may be selected from curves X, A, B, C, D or E. Field-changed by plugging in new choice.

PHASE TRIP SEQUENCE SELECTOR—connections determine the sequence of any two TCC's selected. Field-changed by reconnecting.

MINIMUM-TRIP SELECTOR—resistance cartridges for phase minimum-trip. Marked in amperes. Field-changed by replacing cartridge.

GROUND-TRIP SELECTOR—resistance cartridge for minimum trip, marked in amperes. Field-changed by replacing cartridge. (OPTIONAL)

COLD-LOAD PICKUP—prevents recloser from opening during service restoration current surges.

LOCKOUT INDICATOR—signal lamp for visual indication when recloser locks open. Momentary switch tests lamp in one direction, and indicates lockout of recloser in the other.

LOCKOUT-NORMAL OPERATION—locks recloser open from control panel.

New Electronic Control Revolutionizes Flexibility For L-M Reclosers

Relay, System Protection and Substation Engineers will find that the L-M new Type RE and Type WE Reclosers offer the ultimate in coordinated system protection.

by **N. K. DELANEY**
Product Manager,
Switchgear and Capacitors
Line Material Industries

L-M's new Electronic Control gives a maximum degree of flexibility to the already famous L-M low-cost recloser protection. It is a sensing and control device primarily consisting of solid-state electronic components and time-delay relays.

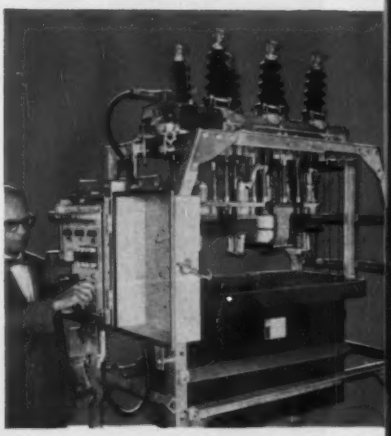
Never before, in any type of apparatus, has the engineer found such great convenience, such dependable accuracy, such flexibility, and such economy, as are provided by the new Line Material Types RE and WE electronically controlled reclosers.

Time-current characteristics, reclosing and resetting delay intervals, and minimum trip current are plug-in components. Sequencing is adjusted on terminal strips. Field changes are made without service interruption.

This control is contained in a cabinet, separate from the recloser, and may be mounted at any convenient location on the substation frame or at base of pole. Remote control and remote indications are easily added.

GET COMPLETE DETAILS

L-M Reclosers with Electronic Control offer the simplest and most flexible means of providing dependable automatic protection for your system. Ask your L-M Field Engineer for Product Information Bulletin CR1WE, and ideas on how you can take advantage of this remarkable new development. Call the nearest L-M office; or phone or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Can.



New Electronic Control is available for both Type RE and Type WE 3-phase reclosers: continuous ratings to 560 amps; in voltages 15 kv and below; with interrupting capacity of 12000 amps at 4.8 kv and 8000 amps at 14.4 kv.

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
Reclosers, Sectionalizers, and Oil Switches

McGRAW-EDISON

485

DISTRIBUTION TRANSFORMERS • RECLOSERS, SECTIONALIZERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
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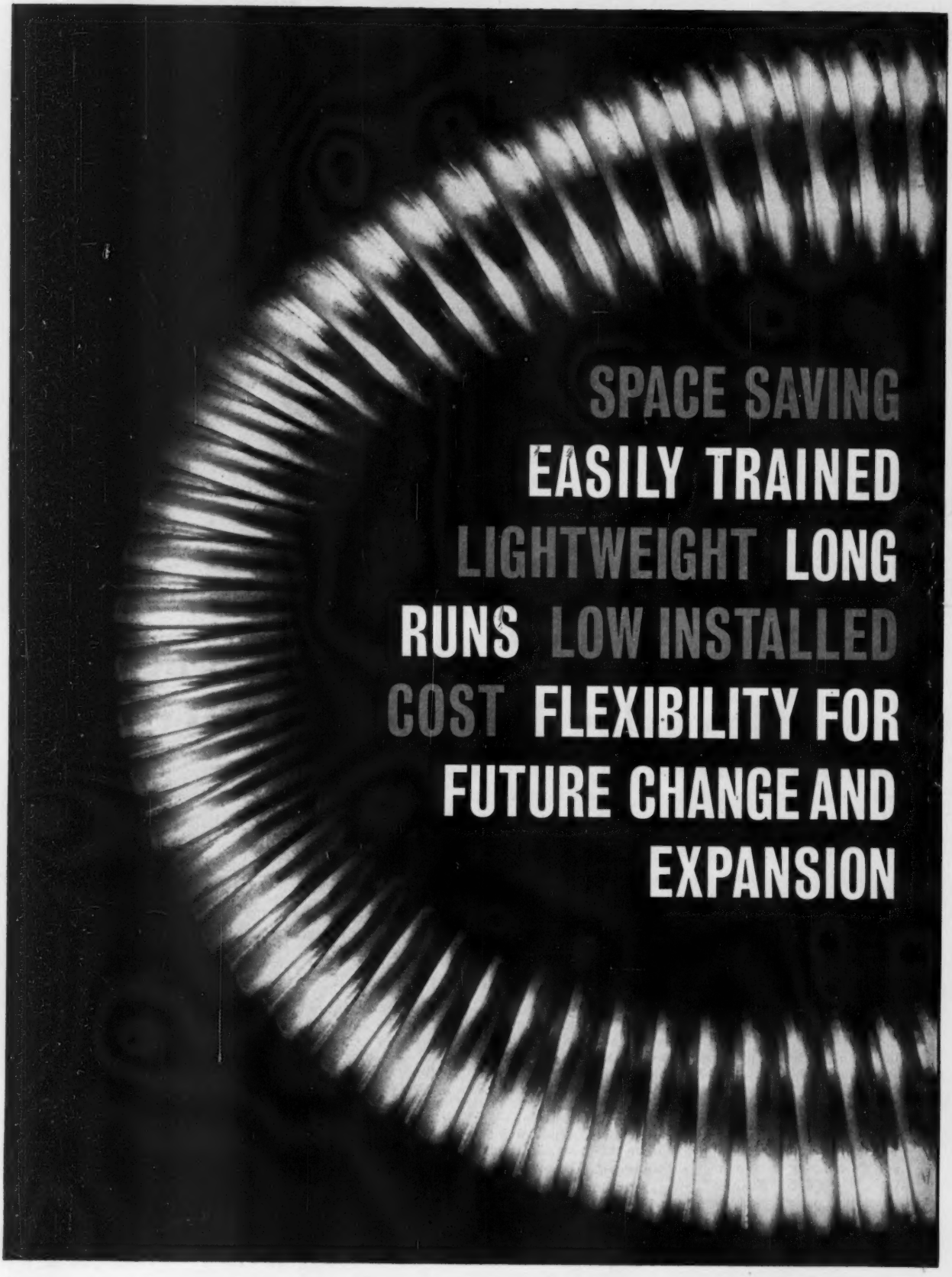
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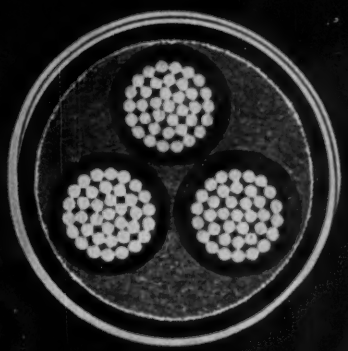
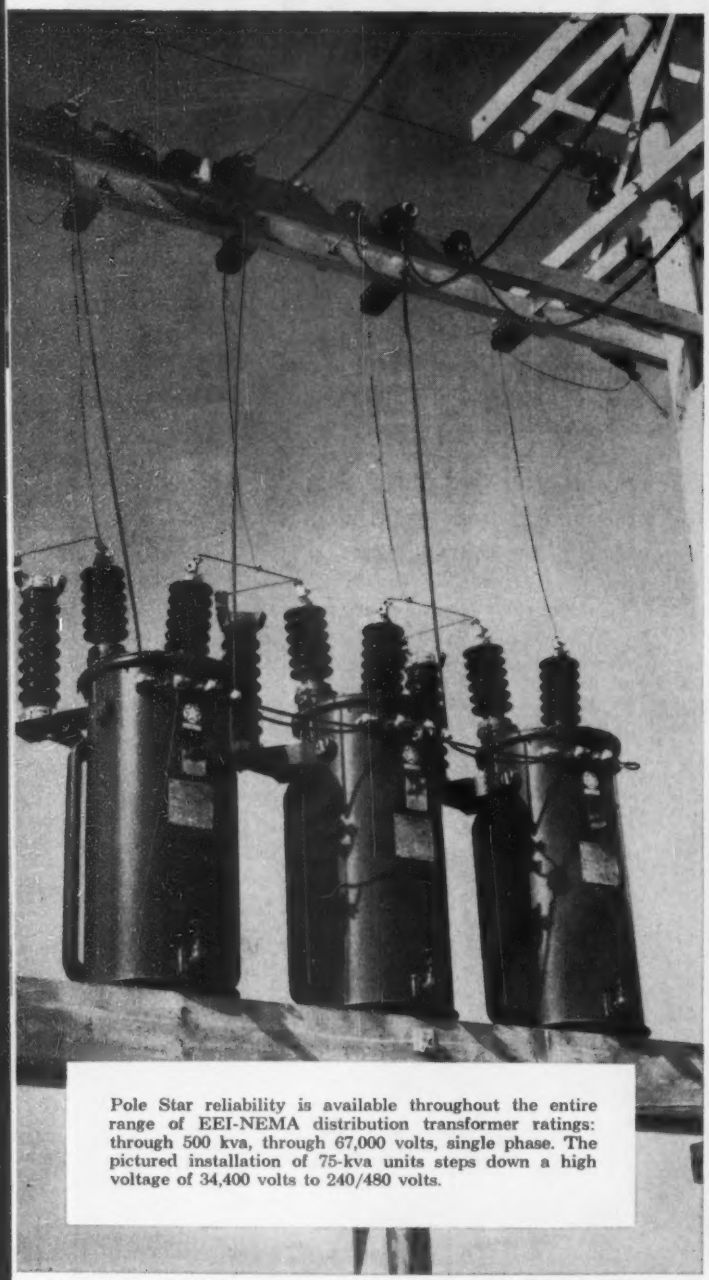
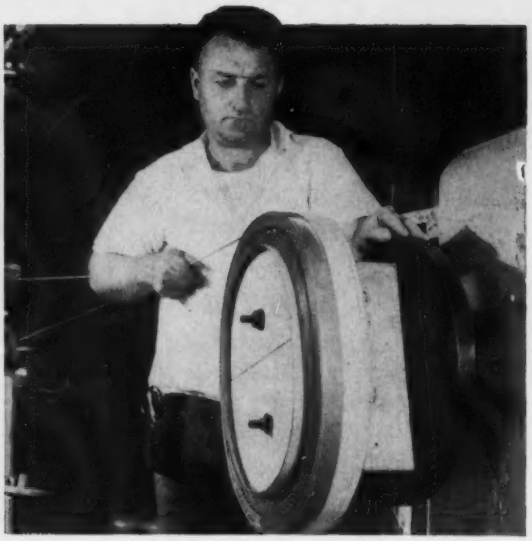


Electrically, Mechanically... POLE STAR®

the ruggedness that's needed

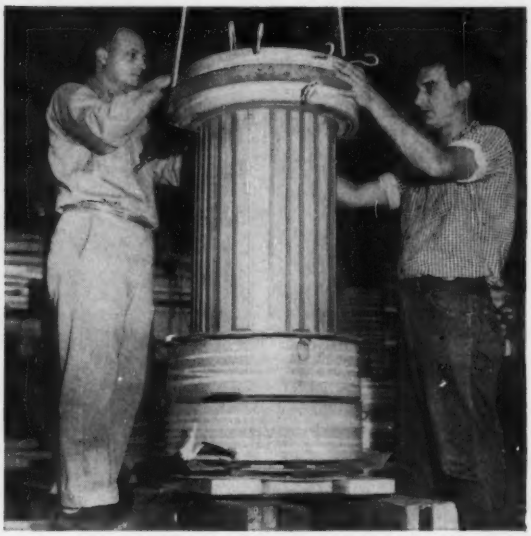


Pole Star reliability is available throughout the entire range of EEI-NEMA distribution transformer ratings: through 500 kva, through 67,000 volts, single phase. The pictured installation of 75-kva units steps down a high voltage of 34,400 volts to 240/480 volts.



Above: Sections of Pole Star high voltage coils are wound on precise molds to assure uniform dimensions. Maintenance of proper tension on the wire, plus the use of thin layer insulation, produces coil sections that are completely firm, without "sponginess."

Below: High voltage coil sections are snugly fitted over the layer-wound low voltage coil. A free flow of oil for cooling is assured by the liberal use of spacers—between the high voltage sections as well as between the high and low voltage coils.



POLE STAR

PENNSYLVANIA POLE STAR

SECTIONAL COILS have for high voltage applications

To obtain uniform distribution of voltage stresses throughout the winding is one of the principal reasons for using sectional high voltage coils in Pole Star distribution transformers rated 34.5 kv and higher. In addition to providing this basic advantage—which results in high resistance to lightning and other voltage surges of impulse magnitude—Pole Star sectional coils feature several Pennsylvania Transformer developments that play an important part in the *sustained performance* of Pole Stars under the most rigorous conditions.

Pole Star Bonding Process Provides Exceptional Strength

Like all Pole Star coils, high voltage sections are wound on precise molds to assure uniform dimensions. By carefully maintaining proper tension on the wire during the winding process, and by taking full advantage of the thinner layer insulation made possible by the Pole Star design, Pennsylvania Transformer craftsmen produce coil sections that are completely firm, with no "sponginess."

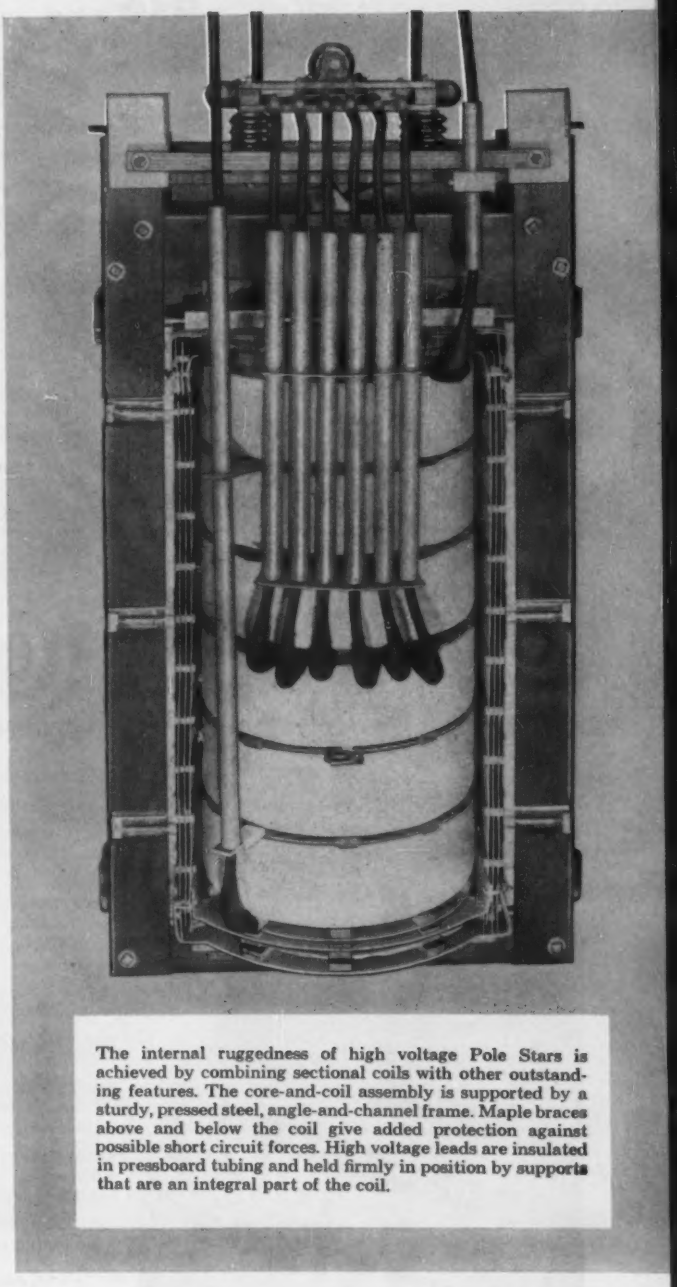
After high voltage sections are snugly fitted over the layer-wound low voltage windings, the completed coil undergoes a curing and drying cycle that firmly bonds each turn of wire to the adjacent insulation, by first softening and then polymerizing a special adhesive with which the kraft layer insulation is pre-coated. This procedure produces a coil with exceptional resistance to short circuit . . . and also assures high electrical strength by retaining the pliability of insulation and permitting the penetration of oil throughout the coil.

Crepe Insulating Collars Give Extra Margin of Protection

A primary reason for the compactness of Pole Star high voltage sectional coils—and for the space-saving, weight-saving transformers they make possible—is the efficient use of the best available insulating materials. For example, the crepe paper used with kraft insulation is folded over at the ends of the coil. This creates an insulating "collar" that achieves maximum electrical strength without adding unnecessarily to coil size. The additional puncture strength and creepage path this collar provides help create an impulse strength that liberally exceeds ASA-NEMA standard impulse levels.

These features and advantages all add up to the *ruggedness* that is needed for high voltage distribution transformer installations. For more Pole Star facts—or for a quotation on specific units—contact Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

McGRAW EDISON



The internal ruggedness of high voltage Pole Stars is achieved by combining sectional coils with other outstanding features. The core-and-coil assembly is supported by a sturdy, pressed steel, angle-and-channel frame. Maple braces above and below the coil give added protection against possible short circuit forces. High voltage leads are insulated in pressboard tubing and held firmly in position by supports that are an integral part of the coil.

DISTRIBUTION TRANSFORMERS

pt

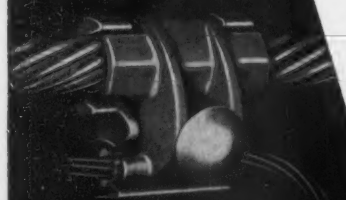
Connect COPPER with COPPER ALUMINUM with ALUMINUM use...

PAC-5
ACSR 6—1/0 Cu. 8—1/0

For complete information and test data: Send for Bulletin #6007

PAC-3
ACSR 8—2 Cu. 8—2

PAC-4
(formerly PAC 6—0)
ACSR 6—1 0 Cu. 6—2



PAC-7 (replaces PARC 6—0)
ACSR 1 0—336.4 / 6—1,0 A/ R Cu. 8—1 0

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BLACKBURN PAC CLAMPS

ELIMINATE CORROSIVE SOLDERS, VOIDS AND FLUXES !

There are many satisfactory copper connectors for connecting copper conductors.

There are many satisfactory aluminum connectors for connecting aluminum conductors.

Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

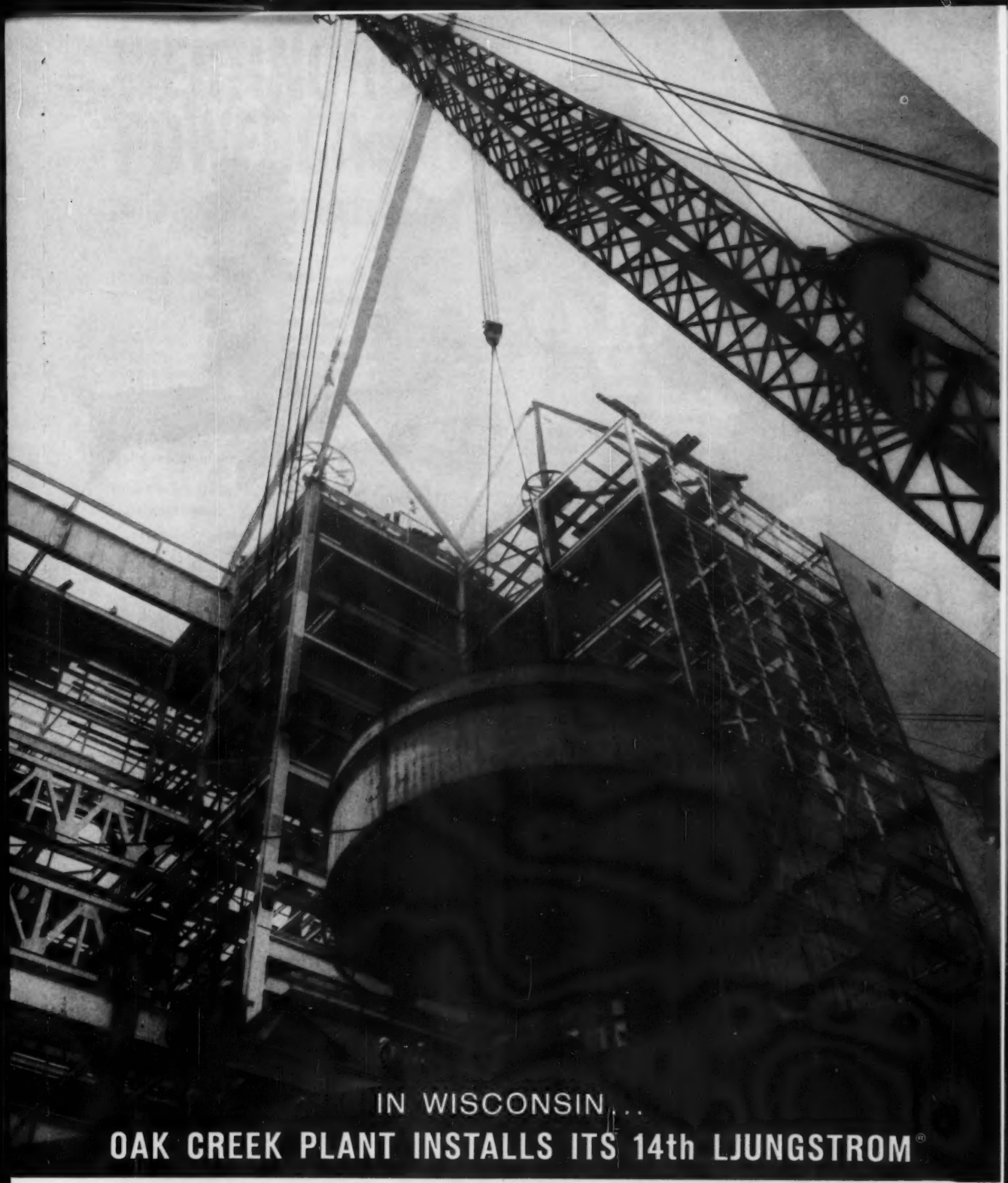
Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

JASPER BLACKBURN CORPORATION

1525 WOODSON RD., ST. LOUIS 14, MO.
WYdown 3-9430



IN WISCONSIN...
OAK CREEK PLANT INSTALLS ITS 14th LJUNGSTROM®

Three new Ljungstrom Air Preheaters are being added to the eleven already in service at Wisconsin Electric Power Company's Oak Creek plant. These three 290-ton units will serve the 1,780,000 lb/hr boiler on Oak Creek's #6 unit. The three Ljungstroms, with a total heating surface of 795,300 sq ft, will reduce stack gas temperature from 550°F to about 270°F and preheat incoming combustion air from 190°F to about 510°F.

Our engineers will be glad to recommend how Air Preheater equipment can improve your operating results on new or existing fuel fired units.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

Good Job, Jenkins!

Now if we could just make it perform like Lapp's...

Lapp Line Posts and Station Posts aren't too hard to copy, we've noticed. In looks, that is. Like most sound designs, they're refined to the ultimate in functional simplicity.

As for performance, maybe that is only a matter of time. In just 30 years Lapp has developed them from original design, through failure-free performance on problem lines and stations, to the stage where many power companies specify them exclusively.

Given the right combination of design engineering, ceramic technology, and day-after-day experience in product refinement and improvement, why, in another 30 years . . .

But *today* is when you could be reducing service interruptions, cutting maintenance and replacement costs, with Lapp Line Posts and Station Posts. Find out now about this better insulator design, from the company that pioneered, proved and perfected it.

Lapp

Write for new Lapp Catalog Eight —tells all about Line Posts and Station Posts. Lapp Insulator Co., Inc., Le Roy, New York.

WESTINGHOUSE POWERCASTING* helps Baltimore Gas and Electric build nation's first underground 240/480- volt residential distribution system

Stately Kingswood by-the-Severn is provided out-of-sight service at an installed cost competitive with overhead system

Five years of intensive studies at Westinghouse have helped make it possible for Baltimore Gas and Electric Co. to pioneer in servicing Kingswood with 240/480-volt underground distribution. *Although still in the early construction stages*, this project indicates an equipment investment and installation cost comparable with 120/240-volt overhead systems. Westinghouse is supplying transformers and meters, and a full complement of major appliances specially designed for 240-volt service.

Total Electric Living . . . a critical challenge to distribution investment dollars

The average home today consumes 3500 kilowatthours of electricity annually. In 10 years, average usage will rise to 10,000 kilowatthours.

Spending for distribution equipment alone is now at a rate of well over one and a half billion dollars annually. In 1969, this area of expenditures for expansion and modernization will virtually equal total electric utility system spending today. On the back of every dollar invested by each utility in distribution equipment today rides an implicit answer to many questions. Is this equipment contributing to system reliability? Can voltage be maintained at acceptable levels? Will this system be economical for load densities triple and quadruple those of today? Are the system design principles this equipment represents those that will be modern 10 years from now?

On the following pages, read how Westinghouse Powercasting has helped one utility answer these and other questions . . . with a completely modern system at Kingswood.

Presently planned for 72 Total Electric Homes, Kingswood, Maryland, will eventually accommodate 500. Heavily wooded, gently rolling acres descend to the Severn River where a fully equipped yacht club serves the community. A country club, golf course, swimming pools and other facilities fulfill a concept of estate living.

You can be sure . . . if it's Westinghouse.

*A Service-Mark of Westinghouse

Westinghouse

WESTINGHOUSE POWERCASTING*

with utility-developer cooperation makes possible massive demonstration

The custom-designed Total Electric Homes in Kingswood, Maryland, will be served electrically by the country's most unique distribution system . . . a direct burial 240/480-volt secondary system. For the first time anywhere, an entire new community will enjoy the benefits of an underground power supply . . . with 240/480-volt secondary service.

BG&E capitalizes on previous successful experience with buried power cable installations

Primary voltage at Kingswood is 13 kv. Primary and secondary cables will be directly buried in the earth. The utility decided that coverings such as concrete or creosoted planks are not necessary. Because of predicted high cable reliability, a radial system was selected.

Distribution transformers are Westinghouse single-phase 167 and 250 kva, pad-mounted type, set on a concrete mat. Permissible loadings are 160% of nameplate in winter, 120% in summer. Steady-state voltage drop from transformer secondary terminals to meter, and maximum voltage dip, are set at 4%.

Comparative system cost estimates prove out higher voltage plans

Overhead 120/240-volt and underground 240/480-volt systems were designed and field layouts prepared by the utility. Costs included 13 kv primary, transformers, secondary, services, metering and dry-type 240/120-volt autotransformers. The developer will bear the cost of excavating trenches, installing conduit under paved areas, and will build transformer foundations. Total investment costs to the utility for the *higher* voltage underground system are expected to be comparable with those for a conventional overhead 120/240-volt system.

# of Total Electric Living concept and the economies of HSV distribution

Developer, architect select Westinghouse to supply special 240-volt major appliances

Each Kingswood home is to be served by a 3-wire, 240/480-volt system. The meter is a Westinghouse 480-volt, 3-wire device. A Westinghouse autotransformer on the load side of the meter supplies 120-volt service to Westinghouse refrigerator, food waste disposer, other small appliances and centrally controlled lighting. The Westinghouse DSL load survey recorder will be installed as part of a joint BG&E-Westinghouse study of loads and load characteristics for future system analysis.

The developer of Kingswood, J. W. McCrocklin, and his architect, D. J. Olivola, selected Westinghouse to design and furnish heat pumps and major appliances suitable for 240-volt operation . . . de luxe broiler oven and platform range, built-in dryer, quick-recovery water heater, dishwasher. Appliance changes involved redesign of some components, and grounding of metal frames to noncurrent-carrying ground wire, separate from the electrical system, to insure safety.

Westinghouse heat pump brings modern air-comfort system to Kingswood

The largest single load device at Kingswood is the Westinghouse heat pump . . . a self-contained, air-to-air unit. Two 2½-hp compressors, two ½-hp condenser fan motors, one ¾-hp evaporator fan motor and 18 kw of supplementary resistance heating comprise this equipment. Based on an outdoor temperature of 0° and a structure heat loss of 75,000 Btu per hour, maximum half-hour demand will be 23.5 kw. In each home, maximum 30-minute load is 28 kw.

*A Service-Mark of Westinghouse

Westinghouse

WESTINGHOUSE POWERCASTING* is ready today to help you apply higher secondary voltages to a new residential area

Westinghouse proposes that you start today applying the principles of Total Electric Living served completely by an underground higher secondary voltage system to a new community

Westinghouse will:

1. Help you determine the precise distribution voltage level appropriate to your total system.
2. Help you engineer and select all distribution apparatus for this new system.
3. Negotiate all *higher* voltage appliances to be used in these homes.
4. Work with you and the developer-contractor to make this new residential area an outstanding example of Total Electric Living.

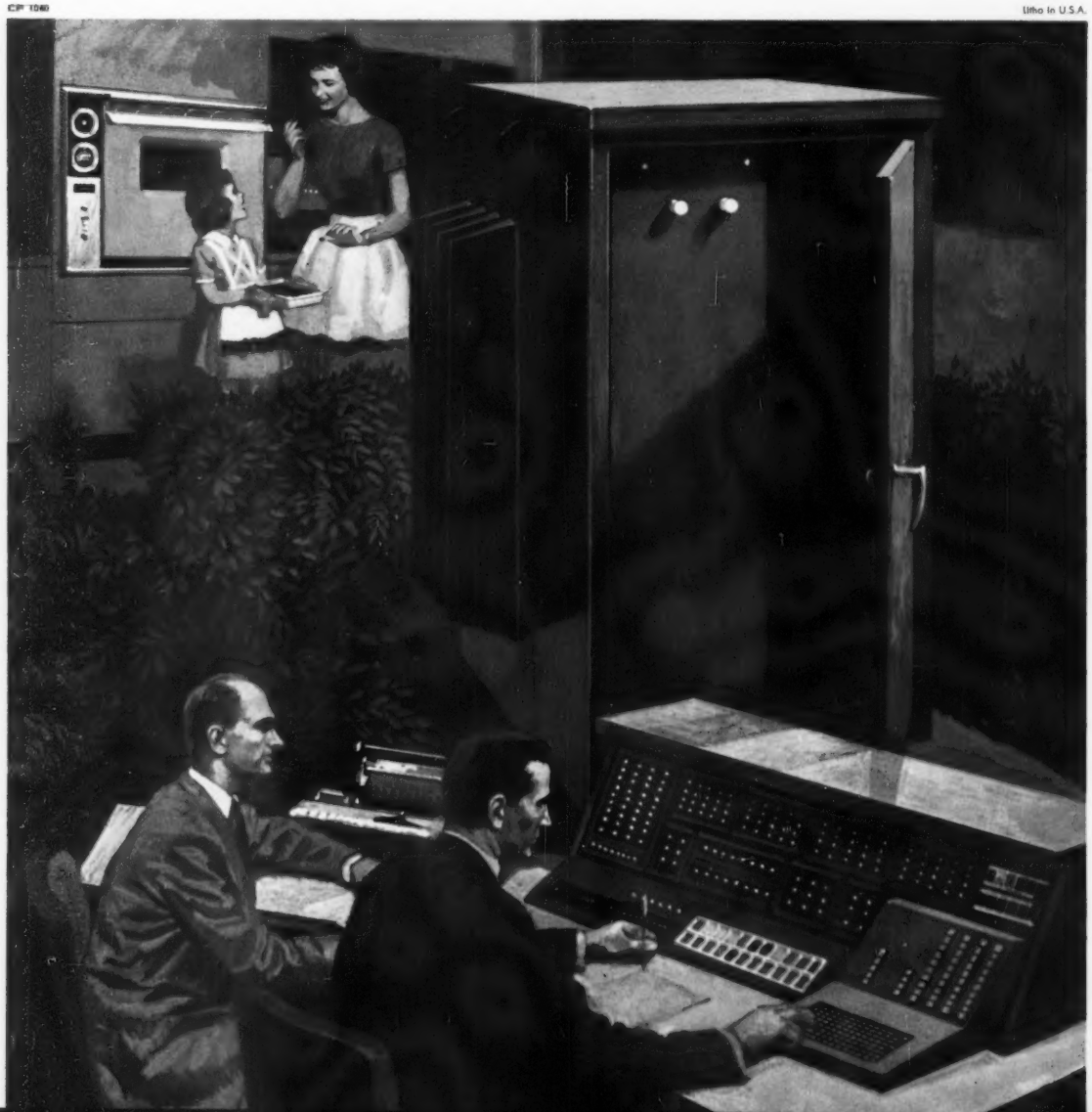
Call your Westinghouse sales representative today . . . ask for Powercasting service

*A Service-Mark of Westinghouse

Westinghouse

CP 1040

Litho in U.S.A.



70% MORE WORKING RANGE with

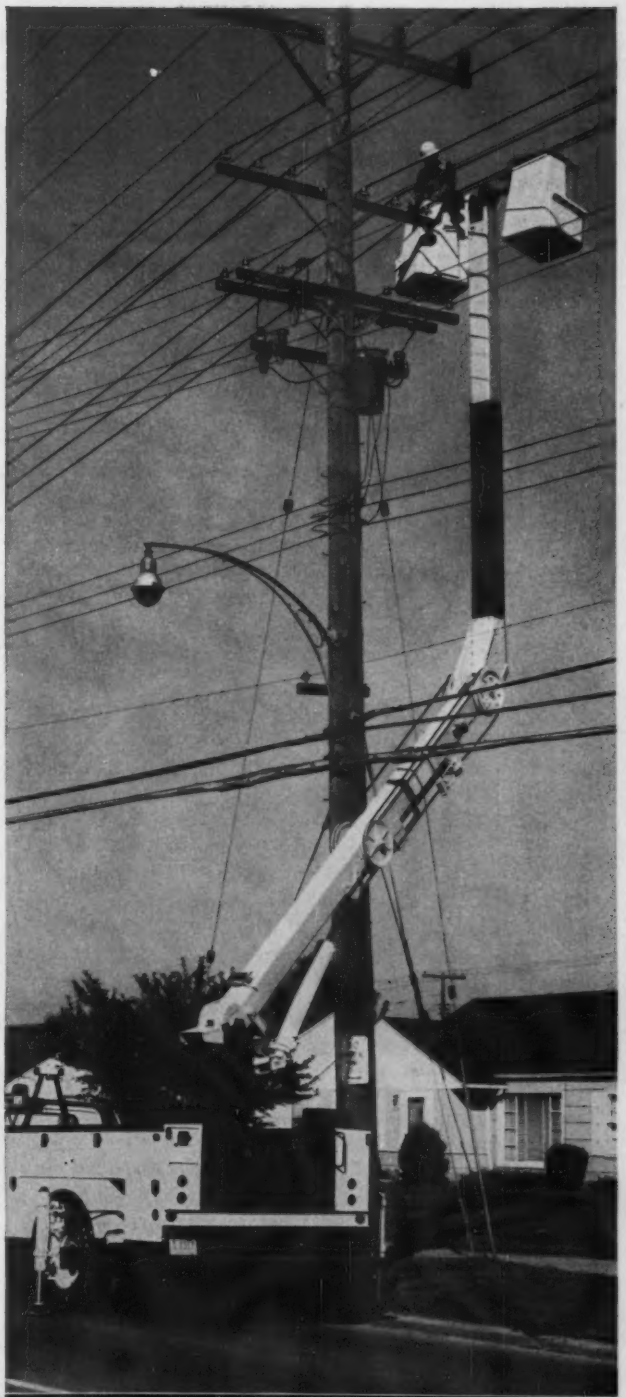
Holan's Unlimited* Action HD-50 Elbow

Holan's unlimited* action Elbow will go straight up . . . or straight out . . . or 13 feet below street level. It has 70% more working range than limited action aerial arms . . . and will put your linemen in a greater variety of working positions than any other aerial arm on the market today.

But it requires "beefed-up" chassis reinforcement and special supporting jacks to offset the tremendous loads. Features like these increase the original cost . . . but less truck maneuvering saves time and dollars in the long run . . . and more than justifies the additional cost of the full-action Holan Elbow.

Safety demands rigidity . . . precise control of the upper arm . . . and fiberglass buckets certified tested at 50,000 volts (A.C.). The upper arm of the Holan Elbow will withstand a one-minute, 200,000-volt (A.C.) dry bucket-to-ground test.

If you require less than full action, see our medium duty or light duty limited action Elbows and our new 65-foot model. And for the very latest in Holan aerial equipment, be sure to ask about the new Holan "Squirt Boom."



Parked at the curb, a limited action, two-man bucket aerial arm could not possibly get in this working position. An unlimited* action Elbow goes under the low-hanging communication cables, then up the property side of the pole without moving the truck.

270° UPPER ARM AND 120° LOWER ARM TRAVEL

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

Subsidiary of THE OHIO BRASS COMPANY

HOLAN

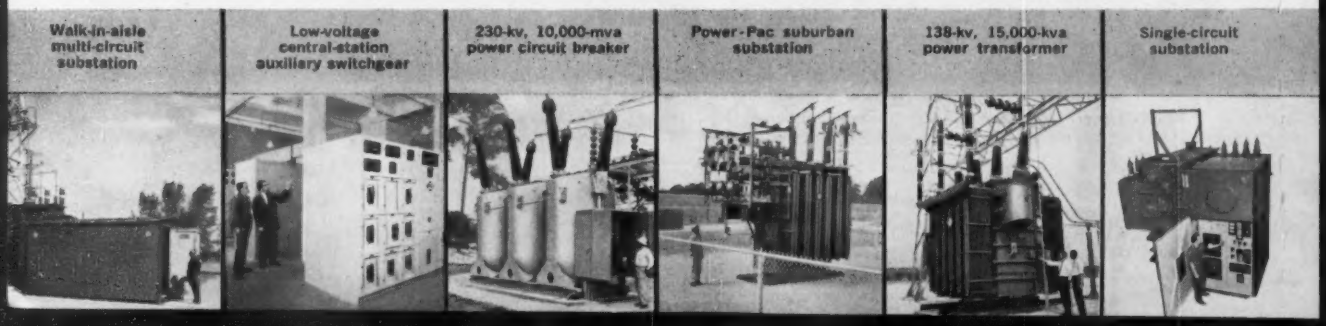
New Allis-Chalmers transformer plant...

best in industry!

TERRE HAUTE.. TRANSFORMER — OIL CIRCUIT BREAKER — SWITCHGEAR PLANT...

includes a three-million-volt impulse generator and a 600,000-volt high potential test transformer installed in the transformer assembly building. These test facilities represent a 2½-million-dollar investment of the very latest design with maximum flexibility for testing all types of electrical equipment. The three-bay tank and plate shop contains some of the largest equipment in the industry — shot-blast room, 1000-ton forming press, 400-ton straightening press and a shear capable of cutting 1-inch-thick steel.

TYPICAL TRANSMISSION AND DISTRIBUTION EQUIPMENT MANUFACTURED AT TERRE HAUTE



West bay of the 130,000-sq-ft transformer assembly and test building showing transformers in various stages of manufacture. At right is the vacuum drying tank, one of the largest in the industry. Vacuum as low as 10 mm of mercury can be obtained . . . for efficient drying of transformers.

The industry's finest facilities for designing, building and testing power transformers are housed in the Allis-Chalmers Terre Haute Works. This investment features over 740,000 square feet of floor space. All product design and test developments are closely coordinated with five major Allis-Chalmers plants at West Allis, Wis., Pittsburgh and York, Pa., Gadsden, Ala., and Boston, Mass. These plants produce a complete range of generation, transmission and distribution equipment for industries and utilities.

The Terre Haute Works is typical of Allis-Chalmers look-ahead philosophy that has pioneered so many industry "firsts" in all phases of electrical generation, transmission and distribution. Also an integral part of this plant are the advanced facilities for building and testing oil circuit breakers and switchgear. *Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.*

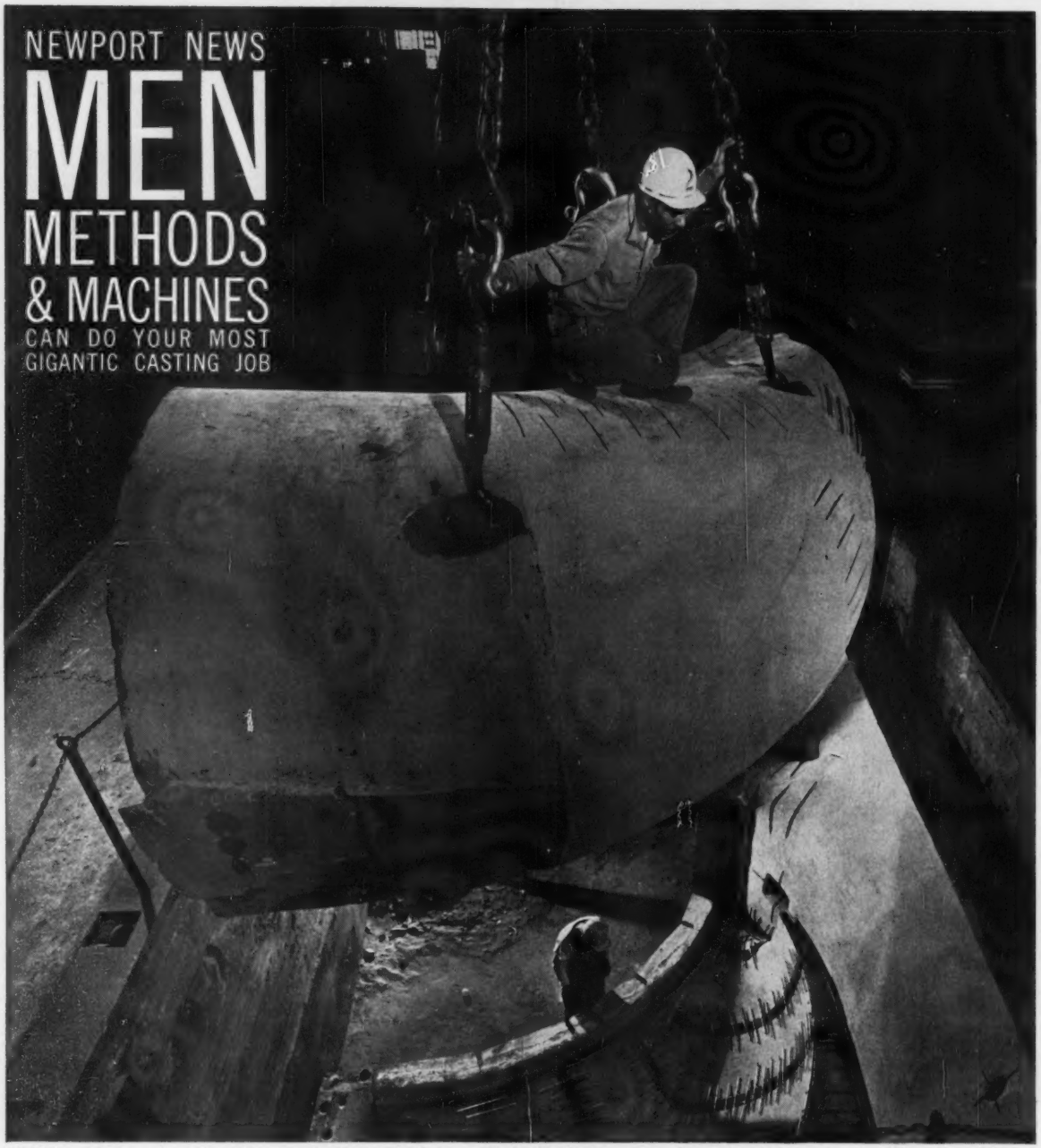
ALLIS-CHALMERS

Pacing Power Progress

Shipment of Allis-Chalmers power transformers on railway spur line flatcars indicates the varied size and application range of these Terre Haute products.

A-1390

20,000-kva mobile transformer



Mold for a section of a turbine stay ring for the Hartwell Power Plant. It is the largest one-piece Y-casting ever produced by Newport News.

It takes all three—men, methods and machines to tackle a job as big as this one! Newport News has completed many of them including six hydraulic turbines for the Niagara Project, four for the Hartwell Power Plant, and many others.

Newport News not only cast this giant unit but also milled it—and built the boring mill that did the work! No challenge is too great.

The secret of its leadership in the fabrication of heavy equipment is its staff of highly trained engineers and technicians, thousands of skilled workmen and 225 acre plant capable of turning out such projects as hydraulic turbines and valves, vacuum or pressure vessels for the petrochemical industry, bridge caissons, wind tunnels, and pulp and paper equipment.

Consult Newport News for preliminary recommendations at no obligation.

Newport News
SHIPBUILDING AND DRY DOCK CO.
NEWPORT NEWS, VIRGINIA

To prove out new designs—American Bridge tests full-scale transmission towers to destruction

Who knows for sure what a hurricane or heavy ice loads will do to a new type of transmission line? To help find the answers to these and other questions, American Bridge has maintained for over 30 years the largest test frame in the country at its Shiffler Plant in Pittsburgh, Pa.

Testing is generally confined to structures which are to be used in great numbers, such as transmission towers. Although testing a full-scale structure is naturally an added expense to the line, the results more than pay for the tests in proving that economical, lightweight structures can be made to do the required job. Any combination of loading conceived by the engineers can be applied simultaneously with these test facilities.

With the use of higher voltages and bundled conductors, tower designs in recent years have gone through many changes. Our test facilities are available to the electrical industry to prove out any new ideas.

American Bridge
Division of
United States Steel

USS

SEE THE NEXT THREE PAGES

New tower designs

and how they are tested by American Bridge

VERTICAL LOADS are applied by suspended trays, loaded with steel plates, and attached to the flexible hanger brackets on the conductor crossarms, and to the U-bolt on the ground wire peak. These trays are raised and lowered manually and independently by chain blocks.

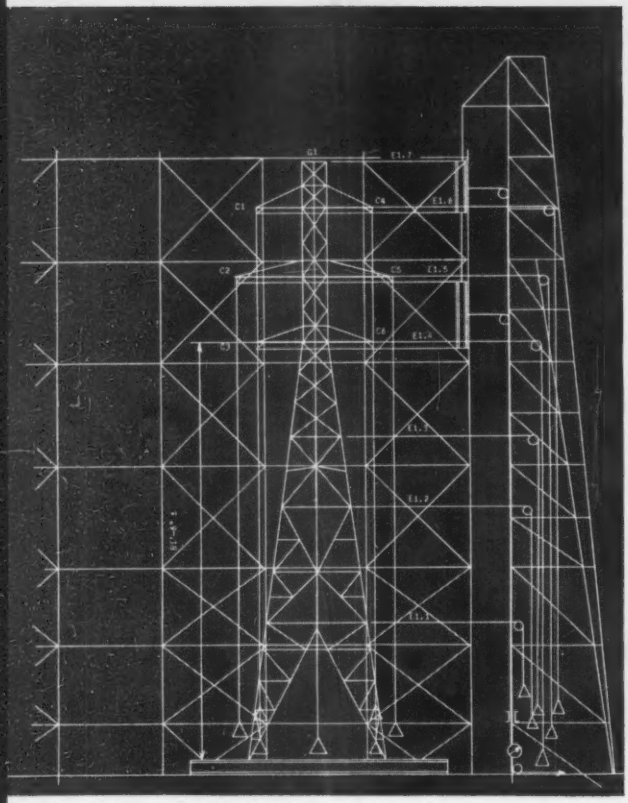
WIND LOADS are also applied with suspended trays loaded with steel plates with lines attached at various elevations, usually six. These loads are transmitted to the tower through strain plates at the ends of the conductor crossarms and by tying the cable around the tower legs. Wind load at the ground wire peak is included as a portion of the transverse load.

TRANSVERSE LOADS are applied by a screw mechanism and measured by a dynamometer connected in series. These loads are transmitted to the conductor crossarms through the flexible hanger brackets, and to the ground wire peak through a strain plate.

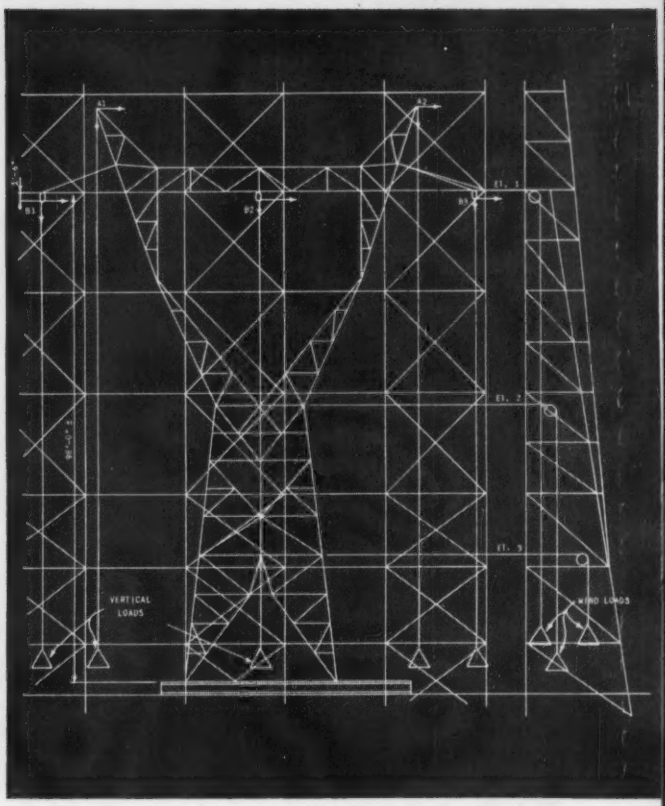
LONGITUDINAL LOADS are applied by a screw mechanism and measured by a dynamometer connected in series. These loads are transmitted to the conductor crossarms through the flexible hanger brackets, and to the ground wire peak through the U-bolt.

DEFLECTION READINGS are taken at the ground wire peak, and at the bottom crossarm, in both longitudinal and transverse faces.

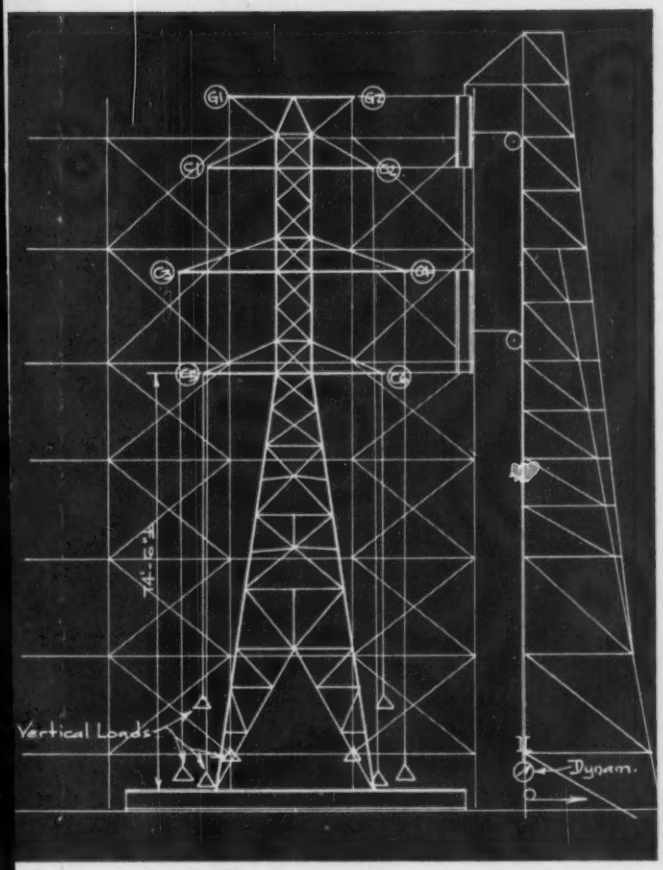
DIFFERENT TOWERS require some changes in these setups but generally the methods are similar for all tests.



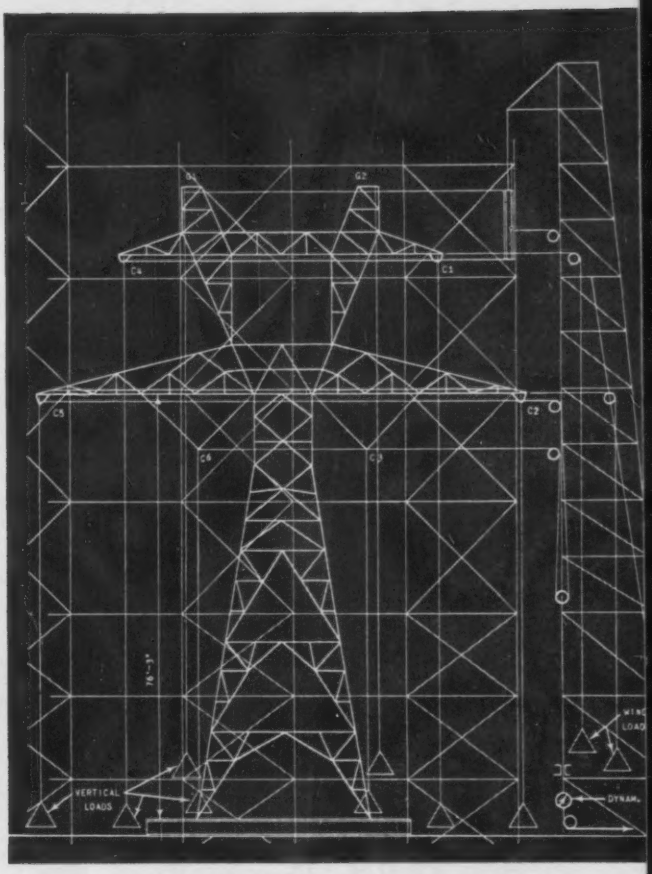
Suspension Tower, American Electric Power Service Corp. This test of a very light 138-KV tower was made to prove that such structures can be designed and fabricated of steel and marketed in competition with competitive materials. The design was extremely light, and the quantity of towers required was sufficient to warrant a test which proved the tower strength.



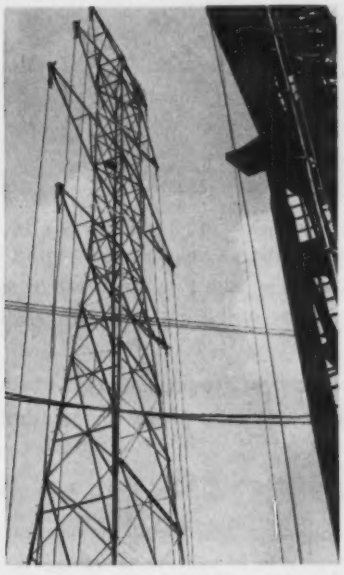
460-KV Tower, Tennessee Valley Authority. This 460-KV single circuit structure was the largest tower of its type ever to be tested. The Tennessee Valley Authority is now constructing a section of 460-KV using these structures and intends to make further use of this type of structure in future transmission lines.

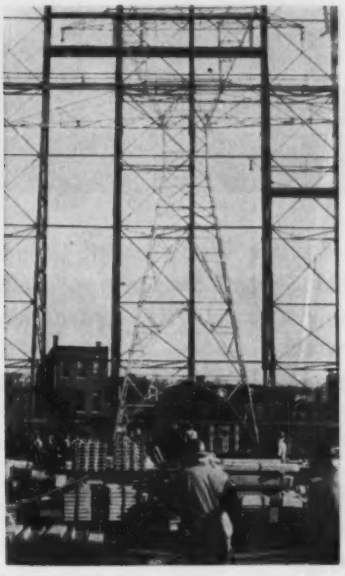


230-KV Tower, Public Service Company of Indiana, Inc., Sergeant & Lundy, Engineers. Sergeant & Lundy designed this rectangular base, double circuit tower to be economical in the use of steel and thus lower costs. The large number of towers justified many design refinements, and the tests proved the light-weight tower exceeded requirements by an adequate margin.



Suspension Tower Type 2A, Ohio Edison Company, Commonwealth Associates, Inc. Engineers. Commonwealth Associates, Inc., designed the unique delta-type, double-circuit 345-KV structure. Because of many innovations in design and its extreme light weight, the tower was tested to determine if the structure was adequate for the design loads.





Watch United States Steel's special Christmas show, **The Coming of Christ**, in Color on NBC-TV, Wednesday, December 21, 8:30 P.M., E.S.T.

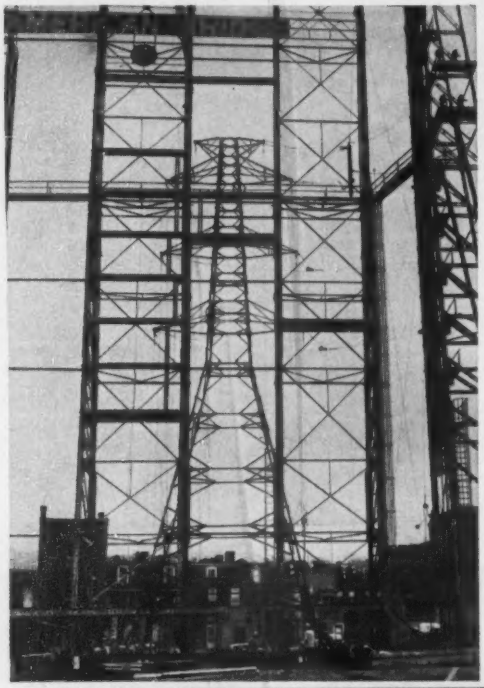
American Bridge Division of United States Steel

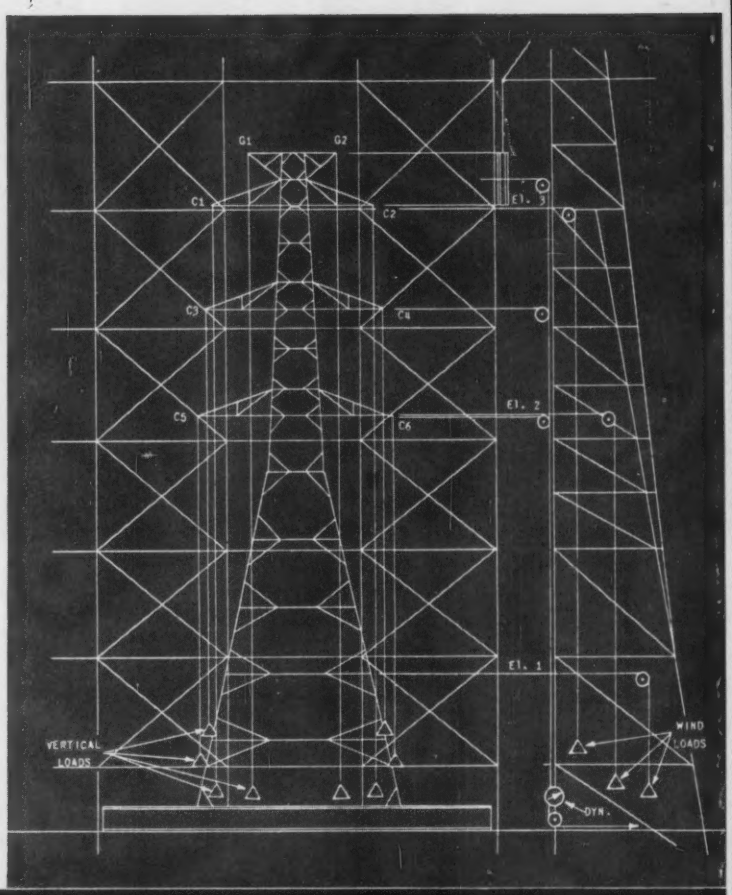
USS

This mark tells you a product is made of modern, dependable Steel.

Unique tower design using Vierendeel truss

Double Circuit Suspension Tower, West Penn Power Company. West Penn Power design engineers designed the pictured structure to solve some of their future transmission line problems. This was an extremely unique design using the Vierendeel truss concept, to our knowledge for the first time in transmission towers. The tower passed the required load tests and is soon to be in service for the West Penn Power Co.





American Bridge, the world's leading transmission tower specialist, pioneered the use of USS MAN-TEN High Strength Steel with A-7 Carbon Steel to trim a ton or more of dead weight from the average tower. Recently, we designed towers to carry the highest voltages likely to be used for the next decade.

For more information or recommendations based on your requirements, write American Bridge Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and MAN-TEN are registered trademarks

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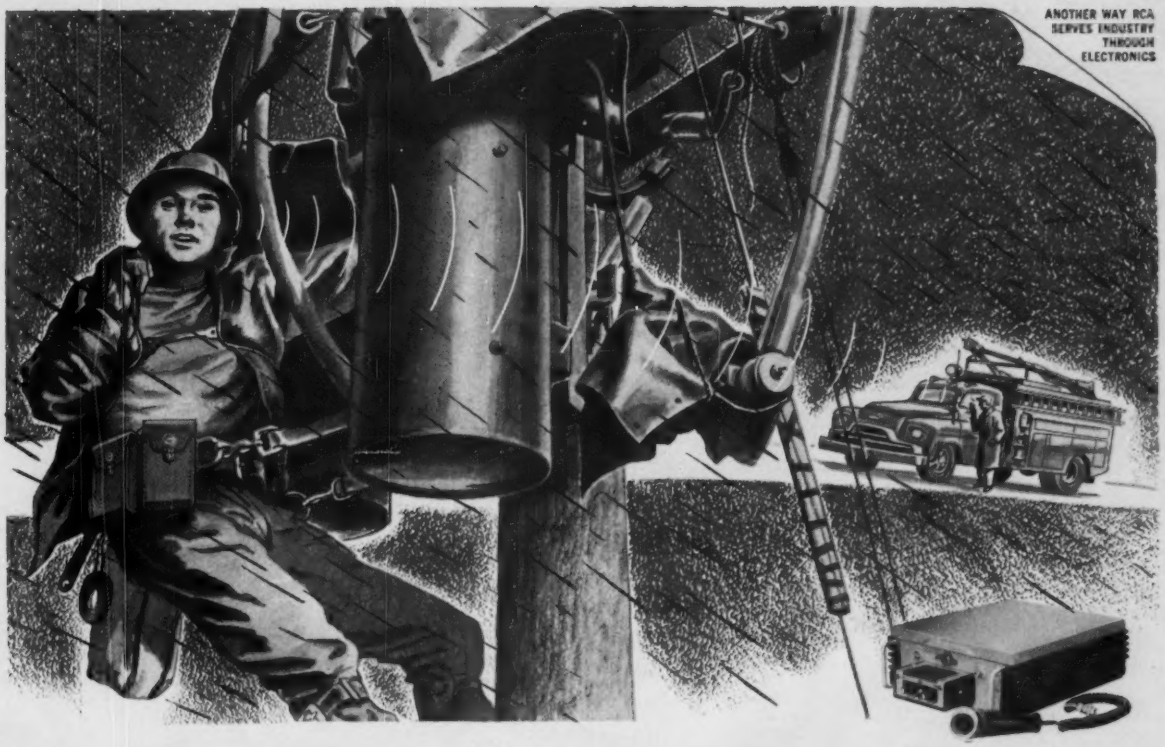


New Communications Convenience and Control for Utilities...

RCA Mobile "LD" Radio with PERSONALFONE!

Here's the way to gain top efficiency in handling your trucks and your men: use dependable RCA 2-Way "LD" Transistorized Radio in mobile equipment, and RCA Personalfone "Belt" Radio on linemen or construction workers away from vehicles . . . for instant contact on the job!

RCA "LD" (Low battery Drain) Radio assures quality that only the leader in radio and electronics can offer. Standard transistors are used in circuits where long experience proves their reliability, and you get maximum on-air time because circuits are "Road Map" coded for fast, sure servicing guidance. You'll like the "LD's" clear spoken voice, too, thanks to a powerful five watts of audio. Feature for feature, dollar for dollar, the LD is "today's best buy in 2-way radio."

New RCA Personalfone miniature "Belt" Radios provide personalized two-way communication extending your radio system to men on-the-go. Your crews are never out of touch with this versatile transistorized receiver and companion transmitter. Both miniature units mount in convenient belt pouches.

Find out about this modern communications equipment today! Lease and purchase plans available.

RCA's FIRST NAME IS RADIO

Your RCA Representative will be glad to discuss your specific communications requirements. Or for complete descriptive literature—write RCA, Dept. ND-45, Building 15-1, Camden, N. J.

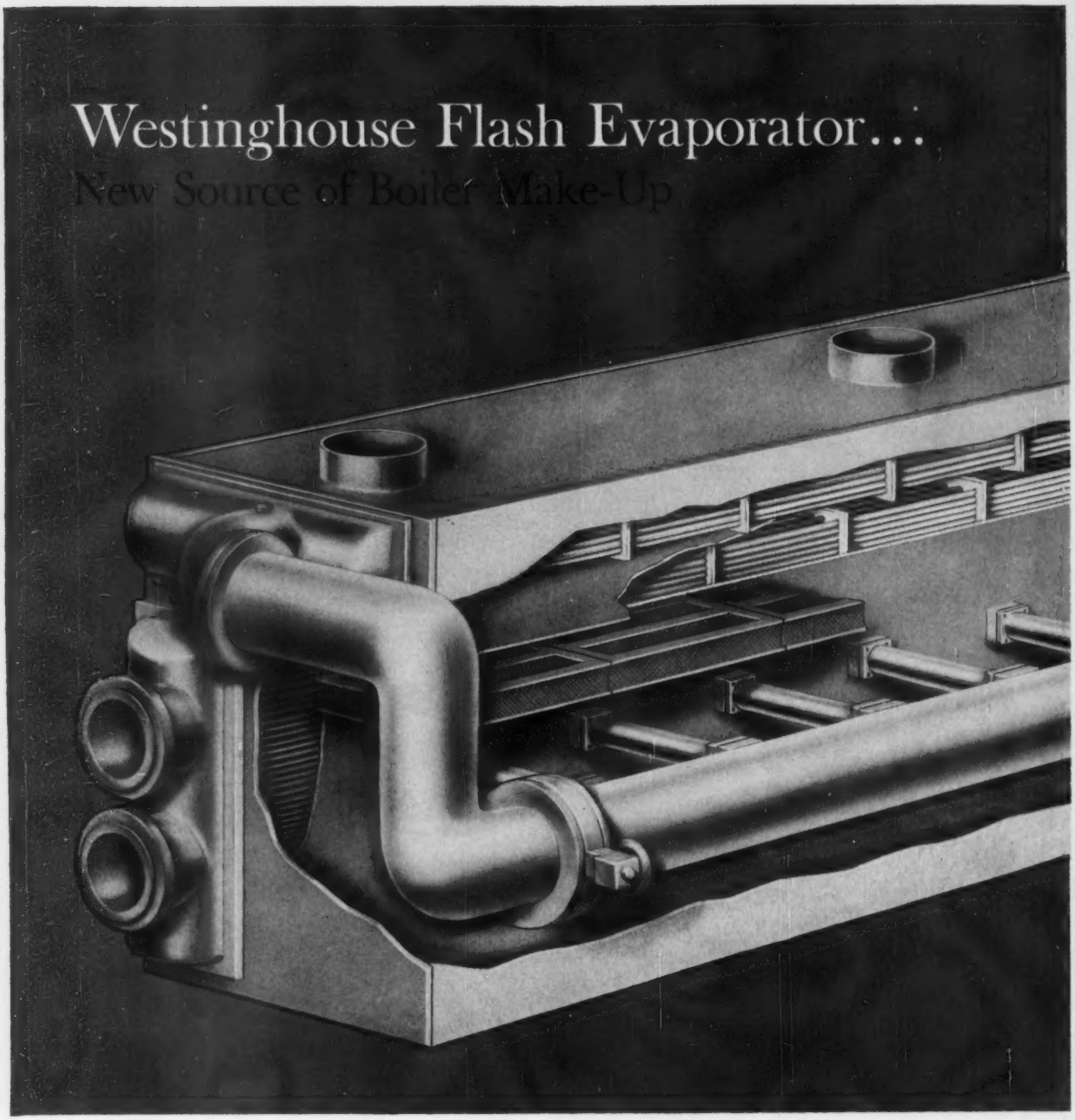
RCA Tmk(s) ®

RADIO CORPORATION of AMERICA

COMMUNICATIONS DIVISION CAMDEN, N. J.

Westinghouse Flash Evaporator...

New Source of Boiler Make-Up

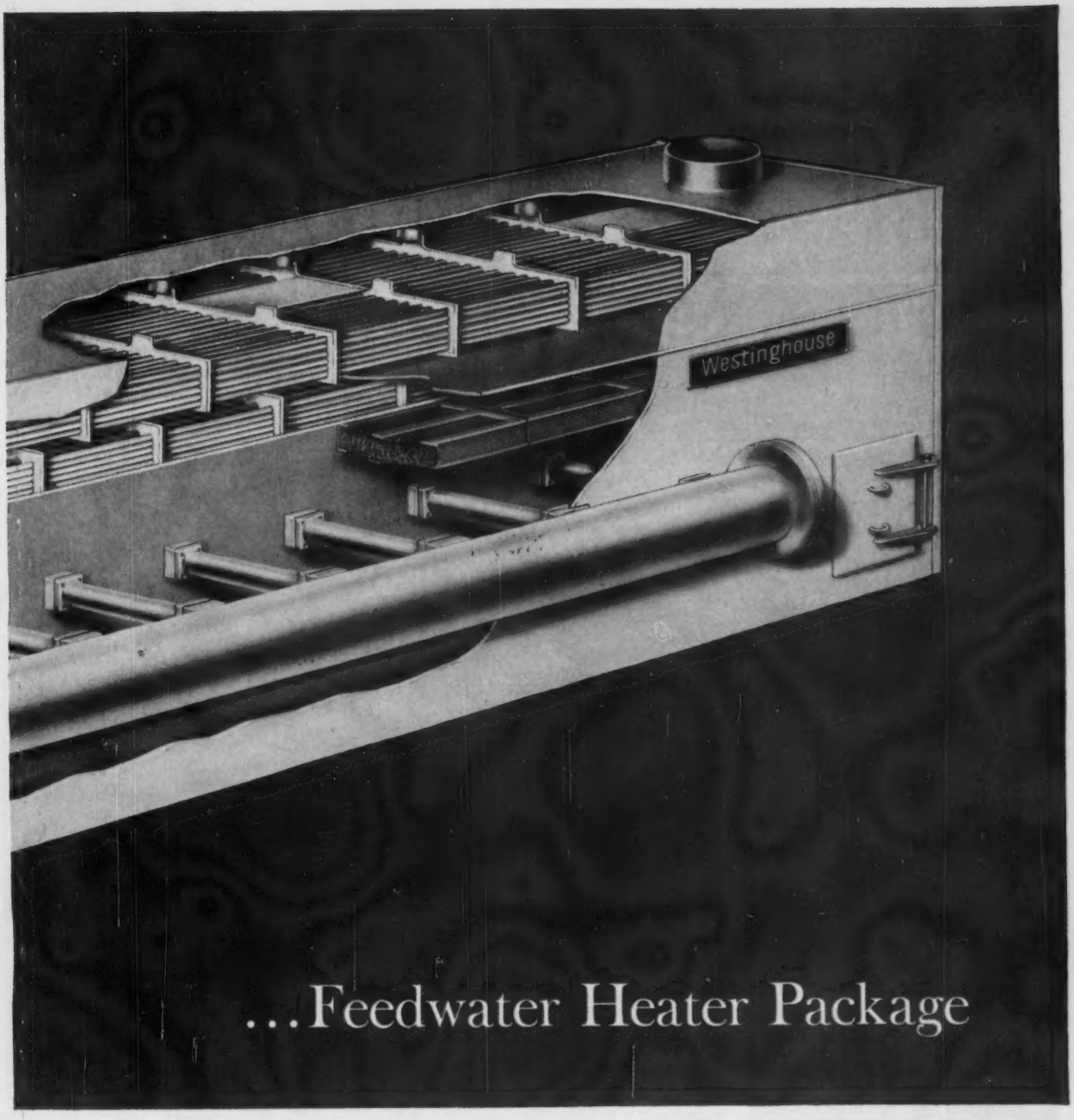


economy

No impairment to cycle efficiency/Integral piping reduces plant cost

purity

0.05 ppm from fresh water guaranteed/0.25 ppm from salt water guaranteed



...Feedwater Heater Package

adaptability

High overload capacity/Feedwater heaters integral with evaporator

You can be sure . . . if it's Westinghouse J-50619

Westinghouse

Get more usable Kva for your

with WAGNER®

SERVING 2 GREAT GROWTH INDUSTRIES—*ELECTRICAL...AUTOMOTIVE*

distribution transformer dollar

HI-THERMAL-CAP *TRANSFORMERS*

Every dollar you invest in Wagner® HI-THERMAL-CAP Transformers really buys a dollar and twelve cents worth of usable Kva. For you can safely uprate these High Capability Transformers to 112% of their nameplate Kva without shortening normal life expectancy... without exceeding the allowable 65°C hot spot temperature rise.

HI-THERMAL-CAP Transformers have new, compact coils wound LV–HV–LV on one insulating cylinder. Corrugated oil ducts and thermosetting barrier insulation lock the sections into a unit of great mechanical strength. Coils have been subjected to short circuit tests using 50 times normal current (two times as great as the industry standard) without failure.

The HI-THERMAL-CAP element, which combines this improved coil with a wound core of cold-rolled oriented grain steel, has excellent electrical characteristics: low impedance for better voltage regulation; low core and copper loss for economical operation. You get full efficiency plus high capability with new Wagner HI-THERMAL-CAP Transformers.

HI-THERMAL-CAP Transformers, built in single-phase ratings 167 Kva and smaller, 15 KV and below (for direct pole mounting), are now available from factory, branch, and distributor stocks. Your Wagner Sales Engineer has complete information. Consult him, or write us.

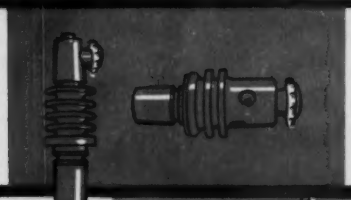
MORE FOR YOUR MONEY IN MECHANICAL FEATURES:

PLASTIC-COATED COVER

A porcelain-like coating gives improved corrosion resistance to tank covers, protects from line to ground, insulates small animals from the grounded cover to prevent outages. Applied to the covers, clamping ring and cover bolts, it is available without extra cost on all transformers with cover mounted bushings.

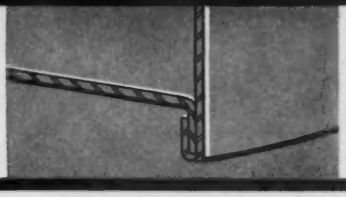
LONG LASTING TANK FINISH

A new formula anti-corrosive paint, carefully applied and thoroughly cured, provides a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.



SAFETY KEYED BUSHINGS

Heavy wet-process porcelain high voltage bushings are safety-keyed. All terminals are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. All bushings are suitable for use with either aluminum or copper conductor.



ROLLED-UNDER BASES

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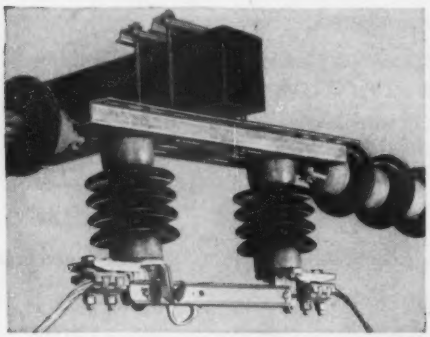

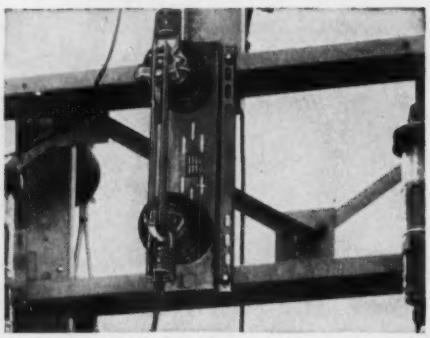

The base is universal, providing double-crossarm mounting as shown on the facing page; or a rigid, double-bracket, single-arm mounting as shown at left above; or through-bolt mounting on steel (as shown at right above), or wood.

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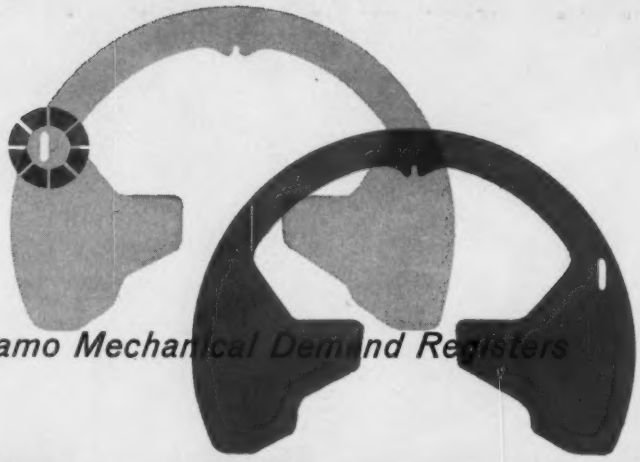
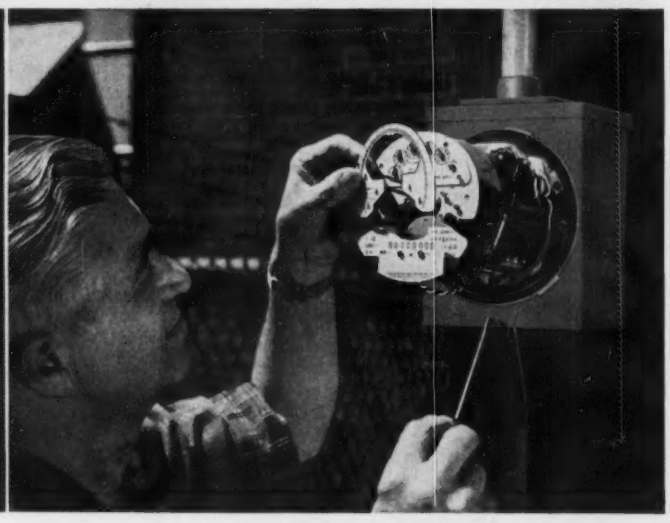
Type DSB – 400 ampere – 14.4 kv – 110 kv BIL

with zinc-tin plated aluminum connectors for No. 2 to 500 mcm copper or aluminum . . . $46.75

DOUBLE THE RANGE WITH A SCREWDRIVER!



with New Sangamo Mechanical Demand Registers



Developed to meet your needs, the Sangamo Dual Range (DR) Mechanical Register features a "flip-over" scale plate that permits rapid changes in range while assuring interlock between scale and range selected. The new DR Mechanical Register is designed to improve metering accuracy with load growth, reduce register change-outs, and cut your inventory costs by reducing the number of meters and registers you have to keep in stock.

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One percent full scale accuracy maintained. The Sangamo DR Register is rated —1% of full scale. This high accuracy is maintained because eccentricity errors and motor field interference are negligible. The register, which retains all traditional features of Sangamo Type D Mechanical Registers is available for singlephase and polyphase meters in both universal and standard scales.

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SPRINGFIELD, ILLINOIS

SH60-6

Electrical World

NOVEMBER 28, 1960

Editorial Comment

Encouraging Youth: Investment in the Future

The 64 electric utilities that sponsored the recent Youth Conference on the Atom (EW, Nov. 14, p 58) deserve the thanks, not only of the rest of the electrical industry, but of the people of the United States generally.

A person has to be on the scene to pick up the full impact of a meeting of brilliant young minds and brilliant mature scientists, but for those who were so privileged it was truly inspirational. One reason it inspires the onlooker is because the students themselves are so enthusiastic that it is contagious. This feeling was obviously captured by the 20 scientists and businessmen who were providing the answers to their questions, too.

How does a person evaluate the benefits of a program of this kind? We do not have the answer, but certainly important benefits must be there. Students and teachers repeatedly expressed gratitude to the utilities for the opportunity of attending. Perhaps it is safe to assume, then, that they will be loyal customers and supporters of the free enterprise the utilities represent. Maybe one of the students will solve a major utility industry technical problem someday. Perhaps some of them will actually be on utility payrolls when they start their working careers.

Sponsorship of the Youth Conference on the Atom, through the Public Information Program, is a major contribution to the future of the scientific leadership of the United States. It is our feeling that this is the most important benefit of all the utilities. It is one that they share with the rest of the nation. It is a worthy investment.

Our Societies Need New Focus

For some time there has been growing concern among engineers, scientists and businessmen with the management of our technology and the pattern of technical societies. There is increasing conviction that the traditional pattern of technical societies is failing to draw together the many special talents needed in today's complex projects and that communication mechanisms must be made more effective.

Clarence Linder, president of the American Institute of Electrical Engineers, speaking at a recent joint AIEE-ASME power conference, put the problem sharply. "US engineering and scientific societies today," he said, "must find new focal points around which to organize and integrate the work done in the many disciplines that make up the profession.

"Today it is necessary to have many branches of science and disciplines of engineering focused on a single problem or project. The opportunities available to the technical societies—beyond their conventional boundaries—are to get those who have the knowledge and understanding together to the end that we can properly organize and manage our modern technology.

"There is need to review objectives and identify the pattern of interest common to the many types and areas of engineering. We must reach out and communicate more efficiently, establish new points of common interest, and organize the various engineering disciplines around these points to achieve unity . . ."

AIEE is moving in this direction with its many programs on special topics and through conferences sponsored jointly with other societies. But many more steps remain to be taken by all societies before we truly unify our modern technology so that its very diversity will be its strongest asset.

AEC Reverses A-Plant Bid Award

The $10,760,370 low-bid of Allis-Chalmers Manufacturing Co finally won the Atomic Energy Commission's invitation for a 50-Mw advanced-type boiling water power reactor to be hooked onto the grids of Los Angeles Department of Water & Power and Pasadena Municipal Light & Power Department.

General Electric Co had first won the award last June with a $12.5-million bid. But after mistakes were discovered in the Contract Selection Board's toting of the Allis-Chalmers bid, the Commission ordered a "re-review" of all bids (GE, A-C, Westinghouse and Combustion Engineering). The switch in award to Allis-Chalmers came after four months of tugging and hauling in AEC's re-evaluation, in which the preference for certain technical components in the GE reactor was argued against Allis-Chalmers' least dollar bid.

Drafts of contracts for the construction of the reactor with Allis-Chalmers and operation of the nuclear plant with the two municipalities have now been sent by AEC to the Congressional Senate-House Committee on Atomic Energy. By law, the Committee checks all cooperative government-utility nuclear power projects.

AEC now expects construction of the reactor completed by early 1964. This delays the mid-1963 date assumed under the project's original timetable.

During the first evaluation of bids, a columnar transposition of figures mistakenly added $500,000 to the Allis-Chalmers bid, making it total $11,260,000. At this figure, AEC decided the still low bid not sufficient to overcome the technical advantages of the GE reactor featuring newly developed internal steam separation components.

Mistake Changes Evaluation

But with the discovery of the mistake, the cost gap between the two bids so widened that it was decided the government would suffer a dollar penalty in buying the GE reactor for $12.5 million. The award was consequently shifted to the Allis-Chalmers design incorporating external steam separators and forced circulation to improve heat transfer cycles in the boiling water reactor.

GE spokesmen are disappointed at having been awarded the construction job only to have it taken away.

Specifically, GE claims the AEC invitation included a primary specification calling for technology which could best be extrapolated to a 300-Mw full-scale reactor generating economic power. GE says its design better fulfills this technical requirement.

The contract award will probably get a further hearing. The construction contract between AEC and Allis-Chalmers and the operating contract with the two municipalities are now being looked at by the General Accounting Office. In turn, GAO will report its findings to the Congressional committee which will be holding hearings on the cooperative nuclear power projects sometime in the near future.

Upper Snake River Hearings Scheduled

About 80 potential water development projects in the Upper Snake River Basin (including 17 hydroelectric generating plants) will be discussed at three public hearings in Idaho this December, sponsored jointly by the Corps of Engineers and the Bureau of Reclamation.

The hearings are at: Idaho Falls, Dec. 7; Twin Falls, Dec. 8; Caldwell, Dec. 9.

These hearings are part of the procedure leading to a joint report by the two federal agencies—their first such combined effort. The report has been under preparation for several years, and a tentative version of it is available now in federal, state and local government offices, plus many chambers of commerce in the Upper Snake Basin area. The final version, including comments and possible changes after the Idaho hearings, will be released sometime during 1961.

Hydroelectric plants proposed in the report have a capacity of 1,250 Mw (including the controversial 90-Mw plant at Burns Creek), while total water storage at reservoir sites would total about 7-million acre-ft. "Some" of the 80 projects proposed in the tentative report "are not presently feasible or acceptable, and their development, or an alternate, may not come about for many years," the two agencies state. However, the list does provide "a rather full utilization of the land and water resources of the Basin," and goes into more detail for this area than the Corps of Engineers' latest report on the entire Columbia River Basin.

Much of the proposed water storage in the area will be underground, the agencies point out. Proposed generating plants could fill power needs in the area for about the next 20 years, the report adds, while irrigation pumping will account for 35-40% of the generating loads. The reason for huge pumping power requirements is that much of the irrigable land lies at considerably higher elevations than potential storage reservoirs.

Largest hydroelectric plants listed in the tentative report are: Garden Valley-Scriver Creek project on the Payette River, Ida., 369.5 Mw; Snake-Narrows project on the Snake River, Wyo., 270 Mw; Thousand Springs Dam, Snake River, Ida., 150 Mw; Mountain Home project, Snake and Boise Rivers, 140 Mw total.

Other plants, in addition to Burns Creek Dam, are: Granite Creek Dam, Hoback River, Wyo., 16 Mw; Elbow Dam, Greys River, Wyo., 14 Mw; Mesa Falls plant, Henrys Fork, Ida., 15 Mw; Warm River Dam, Warm River, Ida., 30 Mw; Ashton Reservoir enlargement, Henrys Fork, Ida., 12 Mw; Fremont Dam, Teton River, Ida., 30 Mw; Eagle Rock Dam, Snake River, Ida., 30 Mw; Twin Springs Dam, Boise River, Ida., 40 Mw; Duncan Ferry Dam, Owyhee River, Ore., 14 Mw.

Nationally, power has minor role, but . . .

Utilities Win and Lose in Local Elections

Election Day results on local power issues turned out to be a melange of joy and sorrow for investor-owned utilities.

In Kentucky, two cities voted to take over local Kentucky Utilities' distribution systems. In Paducah, the vote was about three to one—8,864 to 2,807—in favor of a municipal system. In Glasgow, where a similar proposal was defeated last year, the move for a municipal system squeaked by by 78 votes—1,890 to 1,812. Both cities are aiming to purchase power from the Tennessee Valley Authority. In the TVA self-financing bill, both cities were exempted from the territorial limitations on the Authority. But in Glasgow, where KU has operated without a franchise for some time, the utility has refused to sell its properties. So the city will have to proceed under the time consuming state condemnation laws.

In Washington State, Tacoma City Light received a setback when state voters approved an initiative which will bar all power dams on the Cowlitz and other lower Columbia River tributaries. But the municipal insists that the initiative does not affect its $30-million, 160-Mw Mayfield Dam on the Cowlitz, because of prior federal approval and will proceed with construction, unless halted by a court order. The second dam in the proposed project, a 325-ft high structure developing 300 Mw, might face greater difficulties.

In Thurston County, Wash., where the Public Utilities District is seeking to condemn Puget Sound Power & Light properties, voters defeated F. T. Meyer as a candidate for the PUD board and gave the nod to V. G. Francis. Francis had urged that the PUD seek an advisory vote from the electorate before condemning; Meyer wanted to go ahead without a vote.

In another Washington election, 77% of the citizens in Asotin County voted down a proposal to set up a county PUD. The area is now served by Washington Water Power Co. The action was the second time in five years that such a proposal had been trounced.

Louisiana voters approved, by a majority of about 50,000 votes, a constitutional amendment allowing the state to loan the Sabine River Authority $15 million to start the Toledo Bend project. The project would produce 67.7 million kwhr of primary power and 139.5 kwhr of secondary power. The proposal permits the Authority to sell power to investor-owned companies but prohibits it from building distribution facilities for retail service.

By a vote of about three to two, voters in Greenfield, Ohio, decided to sell their municipal system to Dayton Power & Light Co for $1,125,341 and give the utility a franchise to operate in the village. Terms of the sale, which had already been negotiated, included a provision for running a 69-kv line to the city and building a substation on the outskirts.

In California, the $1.8-billion bond proposal for the state's huge water project got a green light from state voters (for more detailed story, see page 50).

Interior Against Snake River Projects

The Interior Department last week urged the Federal Power Commission to deny the license applications of both the proposed rival Nez Perce and High Mountain Sheep hydroelectric projects on the Snake River. The advent of nearly 1.7 million kw of prime power in the Pacific Northwest from a proposed US-Canadian treaty on the Columbia River was cited as its reason.

The Department's request has no legal binding on the FPC, but it's expected to have a tremendous influence.

Interior Undersecretary Elmer Bennett wrote FPC Chairman Jerome Kuykendall, "We believe that it is unnecessary at this time and for some years to come to undertake any project in this area . . . We are impelled to advise that initiation of a project in the Middle Snake area is not requisite at this time."

Bennett cited the recent recommendation by the Corps of Engineers in favor of High Mountain Sheep, pointing out that the Corps' "observations do indicate, at least in a general way, the impact of availability of power due to Canadian storage and Libby (dam) on the Middle Snake area . . ."

Bennett added that Nez Perce would affect fish runs more than High Mountain Sheep, but that High Mountain Sheep facilities also were "unproved."

Gas-Cooled Reactor Report Issued

With the issuance of a *Status Report on Gas-Cooled Reactors as of 1959*, the AEC has completed its 11-volume report on the Civilian Power Reactor Program. The series comprises parts on the technical and economic states of nuclear power reactors as of 1959 and the developmental and economic outlooks. Included are eight volumes on fast, pressurized-water, boiling-water, aqueous homogeneous, gas-cooled, sodium graphite, organic-cooled and heavy-water-moderated reactors.

The separate volumes are available from the Government Printing Office, Washington, at a total of $12.10.

An index for the eight volumes on individual reactors is being prepared. A companion work, *Power Cost Normalization Studies*, is available for $2.50 from the Office of Technical Services, Department of Commerce.

California Project Bonds Approved

The first bonds for the Oroville Dam on California's Feather River, approved by voters Nov. 8, may be sold in 1963, according to Harvey O. Banks, director of the California Department of Water Resources. He reported he can see no reason why work cannot begin in 1962 as originally scheduled. Banks explained there are sufficient reserves in the state treasury's water fund—set aside by the state legislature last year from tideland oil royalties—to go ahead with construction pending the availability of bond money. There is about $25 million in this reserve fund uncommitted to any other work.

Approval by voters of the bond issue also is expected to speed joint federal-state construction of the San Luis Project. This project will be used by the federal government as a storage unit for Central Valley Project water, and by the state as a storage reservoir for water to be transported to Southern California.

Last-minute support for the bond issue came in the form of consultants reports endorsing the water development program. Dillon, Read & Co, Inc, New York financial consultants, said the plan outlined by the state would meet financial feasibility tests on the basis of present construction levels. The Dillon, Read report claimed the bond issue together with other funds obligated to water development would cover costs except for some $54 million needed after 1984 for final phases of construction. The company estimated total funds required would be $1,872,000,000.

Charles T. Main, Inc, Boston engineering consultant, said the state program presents no engineering problem which cannot be solved by proper design.

However, the firm warned, if the state undertakes construction, it "must be prepared to assume the risk that it might not be completely reimbursed during the bond repayment period which runs to the year 2040."

The plan calls for carrying surplus water from the northern part of California to water deficient areas in the San Joaquin Valley and in

POWER projects, aqueducts, massive movement of water, pumped storage—all these things make the huge water plan one of the great projects in US history

by Voters

Southern California. This water will flow into the delta at the joining of the Sacramento and San Joaquin Rivers near San Francisco Bay and will be distributed south.

There will be a main San Joaquin Valley-Southern California aqueduct extending about 450 miles from the delta to the general vicinity of Los Angeles with east and west branches. A spectacular feature of this aqueduct will be pumping facilities to lift the water 3,400 ft over the Tehachapi Mountains north of Los Angeles.

The Oroville Dam is part of a state water development plan which will consist of channel improvements, levees and control structures; the San Luis Dam and reservoir which will be about 70 miles south of the delta; and a series of dams and reservoirs 80 miles north of the delta to utilize the flow from the Middle Fork of the Eel River.

Oroville Dam, which will be constructed with an impervious earth core and pervious gravel outer shell, will be over 700 ft high with a reservoir area of 3,520,000 acre ft.

San Luis Dam is proposed as a 2,100,000 acre-ft-capacity earthfill structure, 310 ft high and 18,000 ft long.

The Eel River development would consist of Spencer Reservoir of 400,000 acre-ft. This reservoir would divert the flow of the Middle Fork through a 21-mile-long tunnel into Glenn Reservoir on the eastern side of the coastal range.

Main power facilities will be at Oroville Dam where an underground plant of 600-Mw capacity is planned. Thermalito Dam will be five miles downstream with a 105-Mw unit.

Oroville and Thermalito powerhouses will have reversible pump turbine units so that power generation can be reasonably independent of the required water releases for downstream use. The Main report agrees with the Department of Water Resources' plan to develop Oroville and Thermalito power for peaking generation in order to get maximum revenues. Generation will be at a maximum capacity during the daytime hours. During the night and weekend reversible turbines, using off-peak power at cheaper rates, would restore water to the reservoirs.

HARVEY O. BANKS, director of the California Department of Water Resources, says Oroville Dam should not be delayed because of flood control needed

Power facilities at the southern side of the Tehachapi will take advantage of the long drop. There will be Cottonwood powerplants 1 and 2 with a total capacity of 55.6 Mw and Devil Canyon powerplants 1 and 2 with generation capacity of 241.5 Mw. The only other powerplant will be on the coastal branch aqueduct near San Luis Obispo with an output of 11.5 Mw.

While the powerplants south of the Tehachapi are designed for continuous operation with an installed capacity only slightly above the average output, the Main report suggests developing Devil Canyon power plants for peaking operation.

The Main report agrees with the state's proposal to use steam turbines as the driving units of the high capacity, high head lift over the Tehachapi Mountains rather than electric motors as used at other pumping plants of the system. Initial installation of steam generating facilities may be higher than electric drive units but operations will be more economical.

The major change in the Main report from a preliminary report given last summer is the bringing of the Eel River development into the picture in 1980. Both reports contend there is no need to construct Oroville Dam until 1974.

The state, however, is expected to work out some arrangement to proceed with Oroville Dam soon.

"I am not quarreling with the Main report because I think it is a good one," said Water Director Banks, "but the flood control situation downstream from Oroville on the Feather River is one which overrides everything else. The basis for the Main report is an adequate water supply but we can't overlook the very important need for flood control to prevent a repetition of the killer flood of December, 1935."

The bond issue campaign was a long and bitter one featured by frequent clashes between Gov Edmund G. Brown and the Metropolitan Water District of Southern California over a contract. Four days before election, the MWD signed a contract with the state to take delivery of water from the project over a 50-year period.

US Energy Source Adequate Through 1975

The nation's electrical energy demands can be met entirely by domestic sources at least through 1975, and at "no significant increase in constant dollar costs," says a new report soon to be released by Resources for the Future, Inc.

A portion of this report—limited to hydro power—was submitted earlier this year to the Senate Select Water Resources Committee (EW, May 2, p 32).

The new report, called "Energy in the American Economy, 1850-1975," was written by Sam H. Schurr and Dr Bruce C. Netschert. They were assisted, among others, by Board Chairman Philip Sporn of American Electric Power, W. L. Byrne of Ebasco Services, Inc, William E. Dean Jr of the Tennessee Valley Authority, H. M. McIntyre of the Bonneville Power Administration, and Morton F. Searl of the Atomic Energy Commission.

A 1975 US annual electric energy usage of 1.966-trillion kwhr is predicted by RFF, a 210.6% increase over the 1955 figure of 633-billion kwhr. Schurr and Netschert break this down for 1975 (1955 in parentheses) by power use, in billions of kwhr: **industry,** 1,023.5 (308.3); **residential,** 488.6 (144.6); **commercial,** 315.2 (94.6); **government,** 119 (69.5) **agriculture,** 14 (9.4); **transportation,** 5.3 (6.8). The government figures include 57.8-billion kwhr (52.5) for the Atomic Energy Commission.

These predictions foresee more than a 200% increase for industrial, residential and commercial uses between 1955 and 1975; more modest growth for all other uses except transportation, which will decline about 22%.

The report was undertaken because of the "apparent weakening in the domestic energy position of the US" since the mid-1950's, but it concludes that the nation's resources are adequate, if used.

This finding, says the report, at least partially removes the arguments of "proponents of a larger and more determined effort to advance nuclear power technology." Nuclear power, by 1975, will probably account for about 10-15% of the nation's electric power output, says the report, cutting more deeply into coal use. This estimate "is, if anything, on the optimistic side."

Power Use in Billions of Kwhr

	1955	1975
Industry	308.3	1,023.5
Residential	144.6	488.6
Commercial	94.6	315.2
Government	69.5**	119.0*
Agriculture	9.4	14.0
Transportation	6.8	5.3

* Includes 57.8 billion kwhr for Atomic Energy Commission
** Includes 52.5 billion kwhr for Atomic Energy Commission

The report takes a pessimistic view of future nuclear electric power generation: "Against the perspective provided by the history of energy use, it seems likely that even if atomic energy were to become an important element in the total energy picture, it would not have a revolutionary economic or social impact unless new and important ways of employing it were to be found."

Hydroelectric generating capacity by 1975 should be about 60 million kw, estimates RFF, with another ten million kw expected from pumped-storage units. The report adds that "every hydro site would be within range of existing markets," if an economic transmission distance of 600 miles could be developed. This distance could be achieved when 500-kv lines are put into use.

Of the 1.966 trillion kwhr of electric energy to be used in 1975, the report estimates 265 billion kwhr will come by hydro, and 1.701 trillion kwhr from thermal generation (including about 200 billion kwhr of nuclear generation). This compares with 1955 figures of 633-billion kwhr total power use: 413 billion kwhr from thermal (nuclear nil) and 120 billion kwhr from hydro generation.

Utilities Regarded as 'Stable' but Slow

Nearly a third of the electric industry's customers believe that supplying power in the future will be a job too big and costly for the investor-owned companies, the Indiana Electric Assn was told at its recent meeting at French Lick, Ind.

Citing a survey by the industry's Public Information Program, Carl D. Rees, IEA president, noted that this public opinion of private utilities persists despite the Indiana companies' addition of more than 1 million kw (30%) of generating capacity in the last two years, with even more to come.

Many customers see the investor-owned utilities as stable and dependable, but lacking the "forward look," Rees continued, adding that the best means of revising this public misapprehension is the personal contacts of company employees.

Utility stocks can be made more attractive to investors by the industry's refutation of some prevalent fallacies, said Harold R. Young, Eastman Dillon, Union Securities Co.

Investors who hesitate because the industry is regulated, he said, should be told that regulation provides a floor as well as a ceiling for earnings. Similarly, the industry's sensitivity to high interest rates will not be a deterrent to investment when it is generally known that interest rates average out over the long term, he declared.

Many potential investors turn away, Young said, because they have been led to believe that the industry's growth is not always translated into earnings per share.

Young urged the companies to make their properties attractive, to be aggressive in advertising, load building, and area development.

News Scope

A-POWER STUDY — Five-year study of nuclear power potential in Iowa will begin shortly at Iowa State University. Expected results of the study: new knowledge for nuclear generation of electricity; a timetable for practical development of nuclear power; and plans to link nuclear-generated power with Iowa Grid System. The $15,000 study, financed by Iowa Power & Light Co, will be directed by Prof Glenn Murphy, head of the Iowa State's nuclear engineering department. The engineering staff of IP&L will contribute studies of fossil-fuel sources for power generation in the area.

HEARING—The Atomic Energy Commission has set a hearing on Consumers Power Co's application for an amendment to the company's nuclear reactor construction permit. The amendment includes technical specifications for the reactor's containment vessel. The company has also requested findings regarding its proposed step-wise approach to rated power and some design changes. The hearing is Dec. 13.

U/G DECISION—Franco-Belgian power group, SENA, has decided on an underground reactor-heat exchanger for its 242-Mwe Ardennes nuclear power station. Adequate insurance, Belgian financing, and satisfactory fuel leasing arrangements with the US—the three main contingencies that SENA included in its contract award to the Westinghouse-ACEC-Framatome group last July—presumably will be cleared up before the Dec. 31 deadline. Construction is expected to begin early next spring on the $80-million project.

REACTOR—A Molten Salt Reactor Experiment (MSRE) will be built at Oak Ridge National Laboratory to test this concept as a high-temperature steam producer for electric plants. The reactor, which will operate at 1,225F, will contain as fuel a solution of fluorides, including those of uranium and thorium, will be cooled by lithium and beryllium fluorides and will be moderated by graphite columns. Operation is due in 1963. The concept was developed earlier for aircraft propulsion.

SECURITY UNAFFECTED—Imports of large steam turbogenerators are not threatening national security, the Office of Civilian & Defense Mobilization has concluded in study conducted at the request of General Electric Co and Westinghouse Electric Corp. The investigation, covering units above 10 Mw in capacity, determined that industry has and will continue to have capacity to meet mobilization needs; relatively little procurement of very large units from foreign sources has taken place, and federal procurement does not rely heavily on foreign equipment.

COSTLY—Central Illinois Public Service Co will have to pay half the cost of a new signal system along a stretch of Illinois Central Railroad Co track. The US Supreme Court dismissed a complaint by the utility that the Illinois Commerce Commission had wrongfully ordered the payment. It was charged that electric utility facilities interferred with the railroad's signals. The new signal system cost $147,347.

AREA HASSLE—Tennessee Valley Authority has been accused of violating territorial restrictions imposed by Congress. Kentucky Utilities Co filed suit for a Federal District Court injunction to prevent TVA from supplying power for a new chemical coke plant near Calvert City, Ky., which KU says is beyond TVA's five-mile limit. KU says it has a line passing near the plant, whereas TVA would have to build more than five miles of line to reach the site.

DAM DISPUTE—Federal Power Commission's jurisdiction over a dam which a utility wanted to build in Vermont's 27-mile Clyde River has, in effect, been upheld by the US Supreme Court. FPC asserted it had regulatory rights since the river with the dams was navigable. In declining to hear a complaint by Citizens Utilities Co, Stamford, Conn., that FPC should not be allowed to regulate four dams CU owns, the Court supported FPC.

Dateline . . . Jackson, Miss. (*Continued from page 5*)

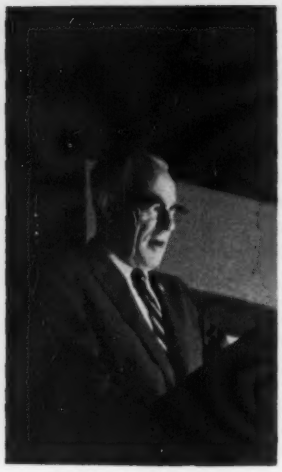
the city limits—or trade some of theirs that are outside the city—but the co-op is not dickering—at least for the present. It has presented a case showing where an adverse ruling now would ultimately force it out of business. Somewhere in the future is a possibility that further litigation could come from what will be paid or exchanged.

This is not the end of MP&L's troubles with co-operatives. Together with Mississippi Power Co, which is really more concerned, MP&L has carried a case to the State Supreme Court in an attempt to get dismissal of a G&T cooperative application for a certificate of convenience and necessity to build a steam electric generating station.

The two investor-owned utilities maintain that they had no opportunity to show that service is adequate. South Mississippi Electric Power Assn is the opponent in this case. MP&L provides only partial service to two of the cooperatives involved, while Mississippi Power serves most of them in the area.

Latest development in this case is the passing of a strongly-worded resolution by the Mississippi Farm Bureau Federation that accuses the utilities of legal delaying tactics. A Rural Electrification Administration loan for the plant has already been secured.

RINCLIFFE



MAIN

GEORGE

Plan Capacity Jointly,

■ More cooperation among investor-owned utilities to give customers "the highest quality service at the lowest possible cost" was advocated by R. G. Rincliffe, president of the Association of Edison Illuminating Companies, late last month at its 75th annual meeting. He called for broader mutual planning, mutual installation of generation and transmission, and cooperation to smooth out the purchasing cycle and so reduce equipment costs. He called upon the utilities for a forward look.

The Association's Load Research Committee demonstrated part of that forward look in reporting that, for the first time, a group of companies has begun to determine by direct measurement the lighting loads in residences. Another home problem, appliance service, received attention as E. O. George, Detroit Edison Co vice president, listed more than a score of maintenance tips for housewives in lowering their repair bills. Association members heard also of the latest utility equipment developments by some of the largest manufacturers.

The President's Address

R. G. RINCLIFFE, President, Association of Edison Illuminating Companies and Philadelphia Electric Co.

"This meeting marks the 75th anniversary of our Association and it is most appropriate for us at this time to link our past with our future. Have we achieved that unity in our business which our founders thought necessary? Have we built so solidly toward our main objective—business success in the public interest—that we have placed our industry beyond the reach of competitors? If we examine the record, we will find that we have not yet fully achieved these goals.

"In our time, we have seen the federal government's entrance into our business. But the basis of our business tenets is a belief in the free enterprise system. Whether our position can be justified and maintained depends ultimately on the decision of our customers, who not only buy our product but exercise their citizenship at the polls. The future of our industry is in their hands. At present we have their confidence but to hold it in the face of changing times there is much yet to be done.

"In the face of constantly increasing costs of all goods and services, how can we continue to improve our performance and keep the price of our product low, thereby successfully meeting competition and insuring the good will of our customers?

"Fortunately, through the use of larger generating units, we still have an effective tool for cost reduction. Machines in the general area of 500 Mw are in service and on order. Units of 1,000 Mw are available. But most of our systems have a long way to go before the use of these sizes is justified. Therefore, if we as an industry are to obtain the benefits from installing the largest units available, it would seem that we can only do so through some sort of cooperative effort.

"There is another good reason for cooperative effort toward the installation of these larger generating units: The advocates of public power would have us believe that only through government ownership can the people of the United States hope to be provided with the highest-quality service at the lowest possible cost. TVA's bigness, its transmission grid and its recently ordered large generators are pointed to as proof of their claim.

"However, the majority of the investor-owned companies have already grouped themselves into giant power pools. Most of these interconnected systems have closely integrated their operating functions and have thus achieved to a major degree the savings that come from integrated area operation.

"Today, more than in any previous time, we must increase our efforts to work together. We must extend to the planning and engineering aspects of our industry the same degree of cooperation which we have used to such good effect in achieving savings from the coordinated operation of our generating facilities. We must wrest from gov-

HUTCHESON

LINDER

LINDE

AEIC Urged

ernment the ability to establish a yardstick. We must take the initiative by:

- Coordinating planning of generation to keep individual company reserves to the minimum consistent with good reliable service;
- Coordinating installation of capacity so that the largest units with their consequent lowest costs can be used;
- Standardizing the design of plants in a given area for proper economic periods;
- Sequential installation of multiple identical units at a single plant before moving on to the next site; and
- Orderly purchasing of units so as to minimize peaks and valleys in the manufacturing production schedules that create high equipment costs.

"Hand in hand with the question of generator installation is the problem of how to be equally forward-looking in transmission planning. Proper planning for company and group use of transmission lines will result in a high load factor over their life.

"The chief ingredient for cutting costs is a willingness and earnest desire on the part of the individual members to work for the common good. Individual company designs must be subordinated to the overall planned pattern if our goal of reduction in capital investment and operating expenses is to be realized.

"The time is now ripe for our industry to enter a new phase of its history. We have already formed giant power pools. We must now meet the changes which so clearly loom on the horizon by a dynamic cooperation, by an all-out acceptance of that old adage, 'United we stand, divided we fall.' There is ample opportunity to maintain the identity of our individual companies through the excellent service we render our customers in the distribution of power generated on a joint basis. We must, however, expand our horizons to secure all the advantages of cooperative effort.

"There should be no rivalry in our business, but a unity, which, if directed toward our main objective—business success in the public interest—would surely place us beyond the reach of all competitors."

Summaries of the activities of the Association's technical committees were given in their chairmen's reports.

Electric Switching and Switchgear

H. R. KURTH, Vice President, Boston Edison Co.

"An inventory of new switchgear installations in the category of 10 kv and above shows a sharp decrease in the volume of switchgear placed in service during 1959, despite steady growth of utility loads. This was due in part to retrenchment during the economic let-down and the elimination of alternate or back-up breakers installed in 1959 than in the previous year. The advantages of the air-magnetic circuit breaker are reflected by 40 more units of this type in the medium voltage field. The acceptance of metalclad switchgear is particularly evident on indoor applications.

"Stored-energy devices for operation of air-magnetic circuit breakers are in increasing demand, since they allow elimination of large control batteries or station service transformers previously needed to actuate solenoid mechanisms. In fact, European manufacturers are offering stored-energy mechanisms as the only standard on metalclad gear.

"The vacuum switch, in which large currents can be interrupted by a minute movement of contacts in a sealed glass vacuum bottle, is finding increased application.

"There seems to be a serious upward trend in factory manufacturing defects and inspection lapses. The number of defective non-metalclad circuit breakers dropped from 468 to 373, showing continued improvement. However, the number of defective metalclad units increased. Twenty-two percent of metalclad breakers installed in 1959 were

AEIC Holds 75th Annual Meeting (*Continued from page* 55)

found defective, compared with 13% in 1958."

Load Research

H. F. G. MAIN, Manager, Business Research, Potomac Electric Power Co.

Until now, determination of lighting loads in homes has been made by estimate and by indirect means. Now a group consisting of the General Electric Co, Middle West Service Co, 22 utilities and the Load Research Committee has made direct measurement of household lighting. In 138 homes from coast to coast, these utility companies revised the wiring to isolate the lighting, which was metered separately for a year. The homes were divided into equal groups of low, medium and high-use residences. These first findings —more are being developed—show that 21.8% of the average customer's kwhr are used by the lights. If this load uses the initial blocks of the rate structure, it constitutes about 35% of the customer's bill.

"Summer demands were substantially less than those in winter, indicating that lighting is an attractive load in areas where air cooling in summer is producing class and system peak loads. Lighting's annual demand factor of 47% indicates a high degree of diversity in the use of individual lamps in a dwelling.

"Throughout the tests, the patterns of use were found to be strikingly similar, indicating that the sample, though small, may be a valid one." As the connected lamp load increased, the energy consumption increased more than the connected wattage did. Highest-use customers consumed 2.7 times as much as the lowest group. Eleven companies light-conditioned a total of 36 homes, which showed consumption increases to 25%. It cost $336 for material and $168 for labor to relight the average home.

Appliances and Servicing

E. O. GEORGE, Vice President, Detroit Edison Co.

The problem of adequate appliance service has been attacked by the Committee four ways:

- The most important effort has been directed to influencing design changes that would permit easier and cheaper repairs.
- The committee asked manufacturers for simplified parts ordering.
- It called upon the appliance makers for operating instructions easier to understand and more complete.
- It is promoting better training for servicemen.

The housewife can help, too. Among the many tips for the lady in the house are these:

"Be sure the dealer's reputation for service is equal to his reputation for bargains.

"Read the instruction book carefully. *Don't throw it away.*

"Be sure the appliance is plugged in."

For washers, be sure the faucets are open, don't overload them, don't turn timers the wrong way, don't soak clothes in strong bleach solutions in them overnight.

Probably the most neglected instruction in the book is the cleaning of lint traps on clothes dryers.

"The condensing unit should be kept clean on refrigerators, freezers and air conditioning units.

"In garbage disposers, bones or hard bakelite should be ground up periodically to scour the food particles out of the cutters."

Power Generation

S. N. FIALA, Chief Engineer, Ohio Power Co.

The natural-draft cooling tower being installed at the Big Sandy plant of Kentucky Power Co will afford the advantages of wider choice for cooling tower location, elimination of more auxiliaries, including fifteen 100-hp motors, and freedom from vapor recirculation and ground-fog problems.

There has been an increase of supercritical units, with the additions of Avon 8, Breed and Eddystone, and of reheat units. "In this report year, 78% of the units, representing a record high of 95.5% of total generating capacity, were ordered as reheat capacity. All units rated above 66 Mw used reheat. The average utility-unit size is now at about 88 Mw.

"The past year marked the first instance of substantial penetration by foreign manufacturers into U. S. markets, with the purchase by public power agencies of an additional 1,526,000 kw of turbine-generator capacity from overseas sources."

Power Distribution

H. P. WHITEHEAD, Vice President, Georgia Power Co.

"One of the major factors in meeting the needs of today and tomorrow is a comprehensive, well-planned program of research. The extra-high-voltage research project at Cornell University continues to occupy first place in the Committee's activities." Knowledge gained by cable manufacturers from basic research accelerated by this project has already been reflected in new products for voltages less than those of this project.

There are also these applied advances in power distribution:

- Increased application of digital computers to engineering and operating problems;
- Reduction of insulation levels on higher-voltage transmission lines;
- Continued trend toward higher distribution voltages;
- Broader application of oil circuit reclosers;
- Innovation in tower design;
- More compact substations and more aluminum for structures and buses in substations;
- Baltimore Gas & Electric Company's 240/480-v underground secondary system for a residential area; and
- Improvement of service entrance facilities as an approach to overcoming inadequate residential wiring.

Meter and Service

A. W. RAUTH, General Meter and Laboratory Supt, Consumers Power Co.

"Data are now being accumulated by various utilities to determine the kind of difficulty that requires adjustments or repairs on meters,"

(*Continued on page* 99)

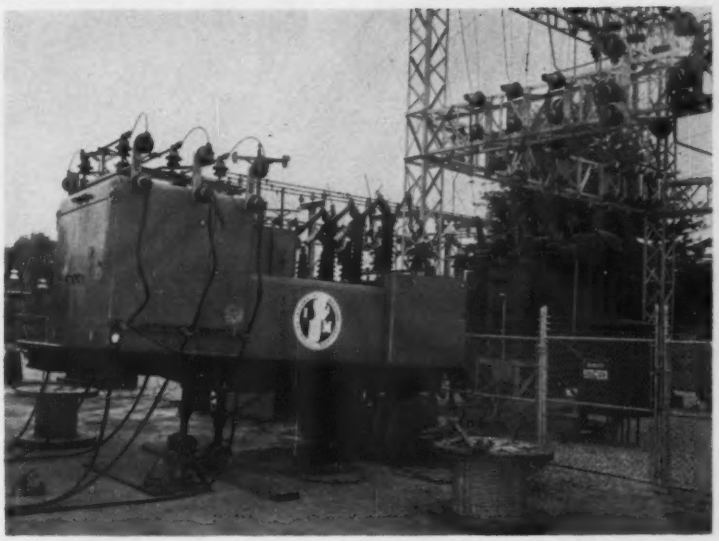
Turnabout Cuts Handling Time

F. W. NEWELL, W. C. HECHT, Indiana & Michigan Electric Company—AEP System

Turning a 3,000 kva, 34.5/12 kv portable transformer station end-to-end on its four wheel trailer permits the tractor unit to easily back into position for the most advantageous connections—and thereby save about 400-man-hours per year.

The high voltage connection governs positioning. Formerly, with the high voltage end in front, considerable winching and handling was required to spot the trailer at a station.

Turning the transformer station end-to-end was accomplished with the aid of an overhead crane: the equipment was cut loose from the trailer; lifted; turned around; set back down; and, rewelded to the frame.



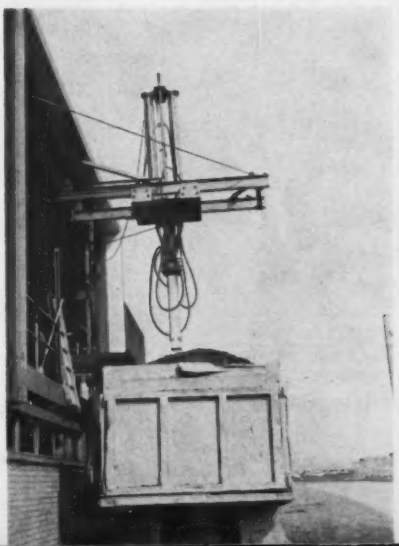
Coal Sampler Gets to Bottom of Heap

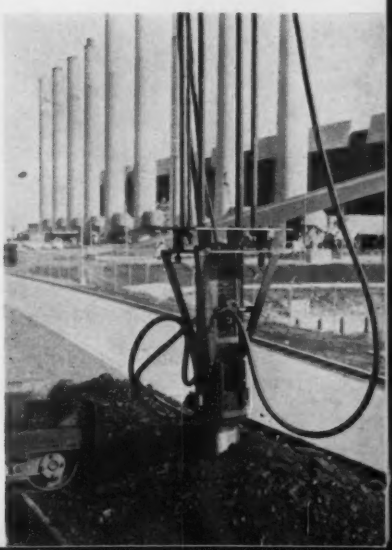
A mechanical device obtains a representative top-to-bottom quality control sample from each truckload of coal hauled into TVA's Kingston Steam Plant. Furthermore, the manual labor now involved in sampletaking has been reduced to a minimum.

Mechanical devices have been used for several years in sampling railroad coal cars. However, until recently a "man with shovel" obtained the samples from coal trucks. This procedure not only was laborious, but more important, it produced top layer, rather than representative whole-load samples.

The new coal sampler is built around a hollow tube which is driven into the coal with a modified pneumatic hammer. Upon reaching a predetermined depth, two hinged leaves at the bottom of the sample tube are mechanically forced together, encasing all the coal in the tube.

After the full tube is withdrawn from the coal and moved to the sample conveyor belt, the hinged leaves are mechanically separated, and the coal falls from the tube. As it falls, varied-quality layer loading of the coal truck and coal of obviously inferior quality can be readily detected. After visual inspection, sample is transported to the laboratory and quality-analyzed.

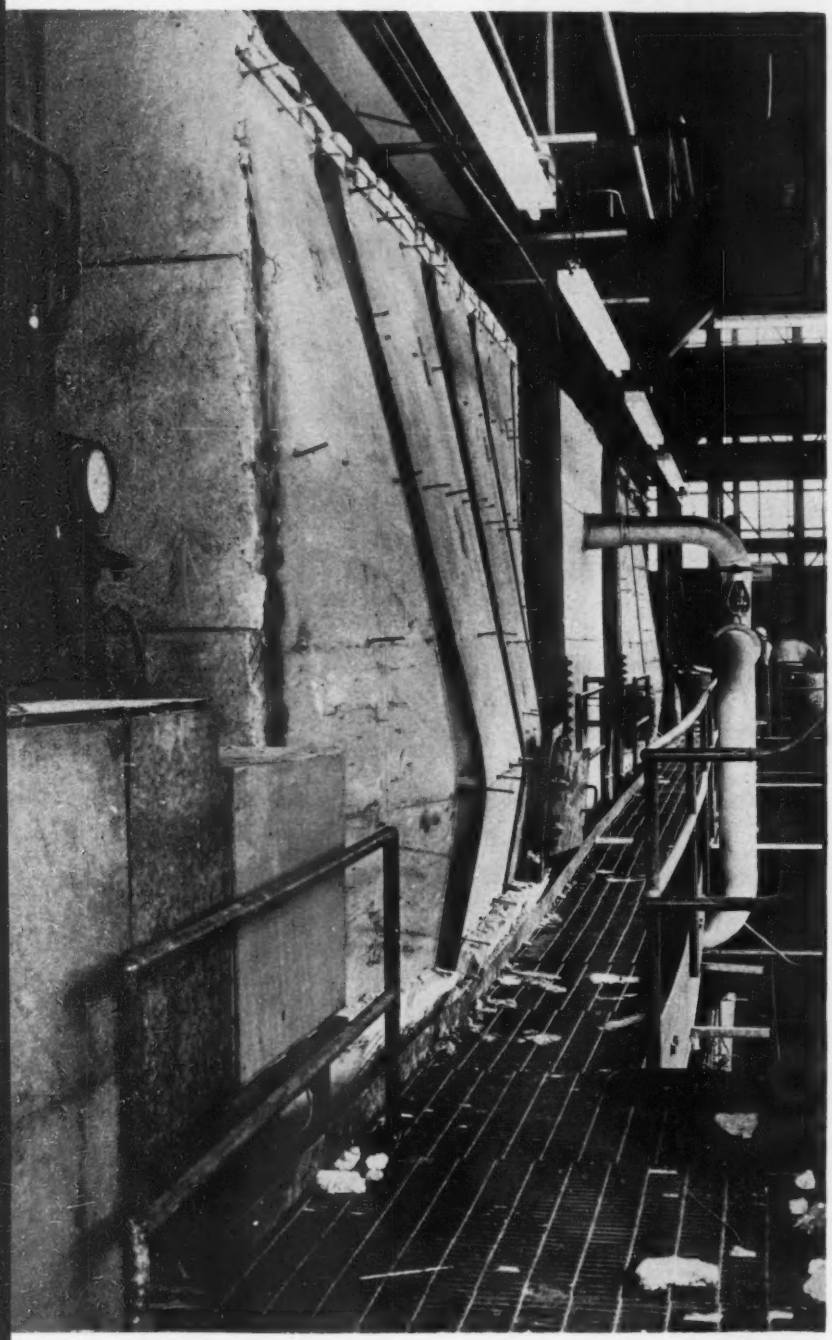




Cold-Pull Method Straightens

Luff and hoist type riggings restore three columns under load, deformed by boiler explosion at Joliet Station

J. C. FITCH, Engineer, Commonwealth Edison Co,
M. ZAR, Engineer, Sargent & Lundy, Engineers, Chicago, Ill.



BOILER EXPLOSION left bulge on boiler's side besides damaging steel columns, beams, and other building members. 250-ft columns were bent as much as 12½ in. out of alignment. Restoration had to be carried out under column loading

The straightening of three 250-ft steel columns that incurred 12½-in. horizontal deflections was a major repair problem of Commonwealth Edison Co following last year's boiler explosion at Joliet Station. The columns had to be straightened carrying their loads.

One column, X-28 (see Fig 1, p 60) carried a vertical load of 1,000 tons. Loading on the other damaged columns, X-29 and X-30, was much less. Maximum deflection was at elevation 255 ft 9 in. Rigging and supports were installed, and it was expected that the repairs would take considerable time.

Calculations showed that the eccentric load on X-28 could be restrained by horizontal pulls of 1,400 tons at elevation 255 ft and 1,150 tons at elevation 246 ft. Accordingly, two lengths of ⅞-in. wire cable were installed from X-29 to W-28 and W-30, and the required tensions applied. Two 36-in. dia downcomers and an air duct were supplied with auxiliary supports because their original carrying beams were badly damaged.

Heat Straightening Risky

Application of heat to the columns to facilitate the straightening process was considered and abandoned. Heating up to 800F would be of little or no benefit, and temperatures above 800F carry a risk of reducing column strength. Thus the job was done by cold pulling.

Rigging for pulling was set up at seven elevations, five of the seven sets of rigs being the luff type. The hoist type was used at two elevations. Pulling was simultaneous at the seven levels, a little at a time.

Cable tensions were applied in the luff-type rigging by 6-ton, hand-operated ratchet pullers. In the hoist-type rigging, a gasoline-powered hoist supplied the lead line pull. Falls, cables, and hoists were

Blast-Deflected Steel Columns

connected to the columns by shackles and 1-in. welded gusset plates. A total pull of 368 tons could be exerted at all levels.

A record of the columns' response to the straightening process was obtained by means of four sight rods attached to X-30 and projected through the outside wall, where they could be read frequently with a surveyor's transit.

Instrument readings on the sight rods, taken as the cables were pulled, were thus recorded. To assure that observed movements on the sight rods were not obtained at the expense of movement of X-24 at the building wall, taped measurements were taken regularly through the boiler between columns X-24 and X-28. The results show that X-24 did not move, and that the pulls against X-29 were transferred directly to X-28 without buckling between these columns.

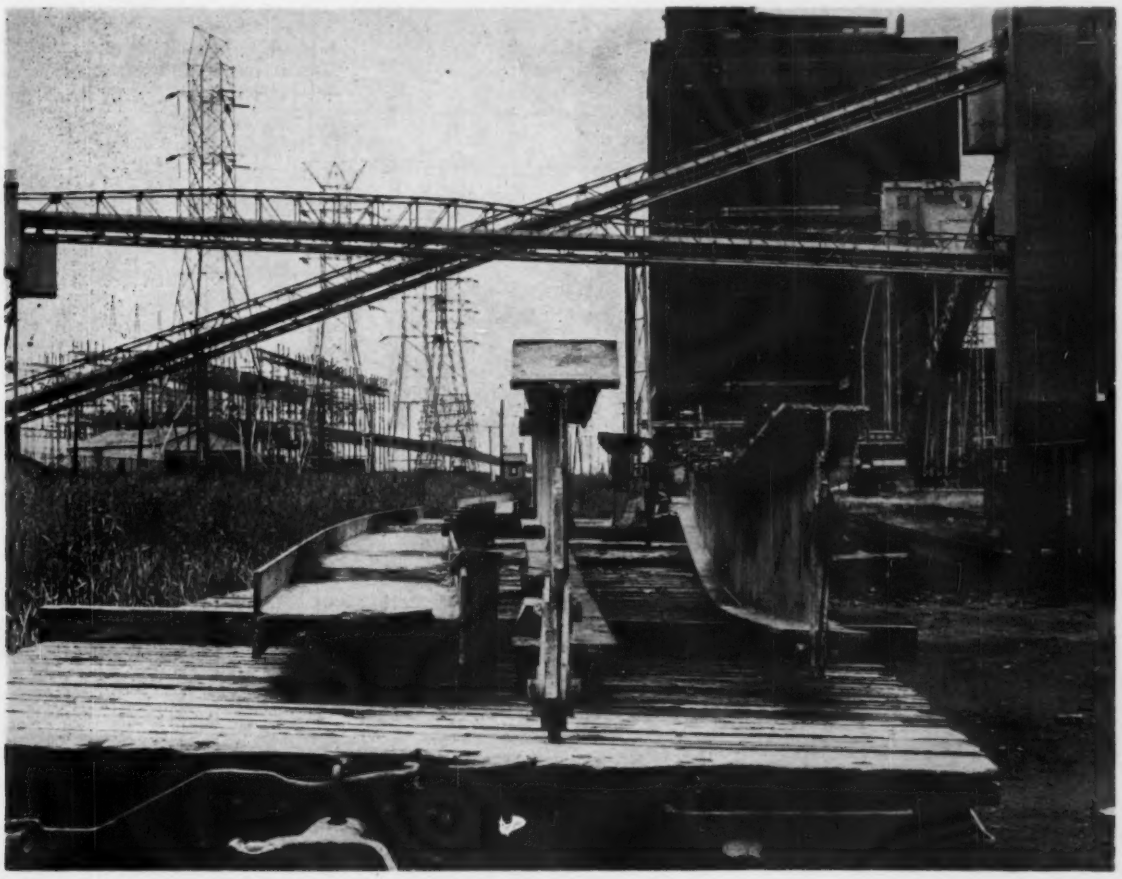
The external readings, therefore, were accepted as measurements of the movement of X-28. Instrument readings along with plumb-bob alignments on X-24, indicated no movement of that column during the straightening of X-28. Final readings agreed with the lateral deflections, indicating that the columns were plumb.

Bracing Cut Loose

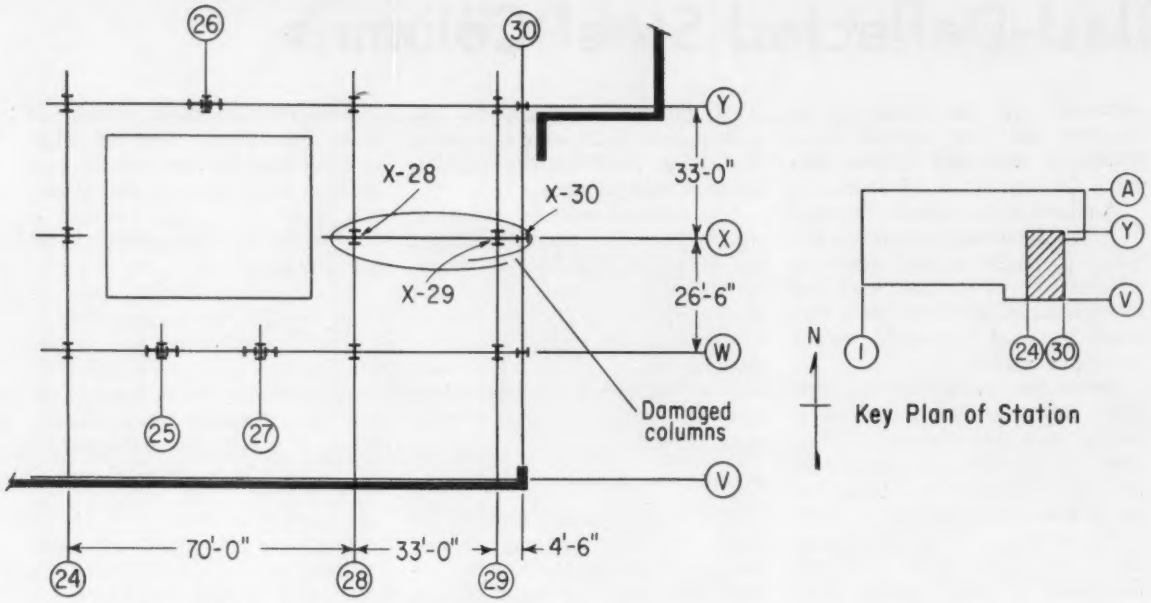
Horizontal bracing, designed for lateral tension loads at various levels, had buckled due to compression forces resulting from the explosion. These members appeared to resist the realignment process and were cut loose. Various high-strength bolts in wind bracing connections were loosened also to permit slight horizontal rotation in these heavy-beam connections as the columns moved.

In less than two weeks, cold pull alone brought the columns back to a virtually vertical position. It was then necessary to determine how much relaxation would occur in the steel as the cables were released. When, as a test, the hand-operated ratchet pullers at elevation 296 ft were released 3 in., about ⅛ in. was lost.

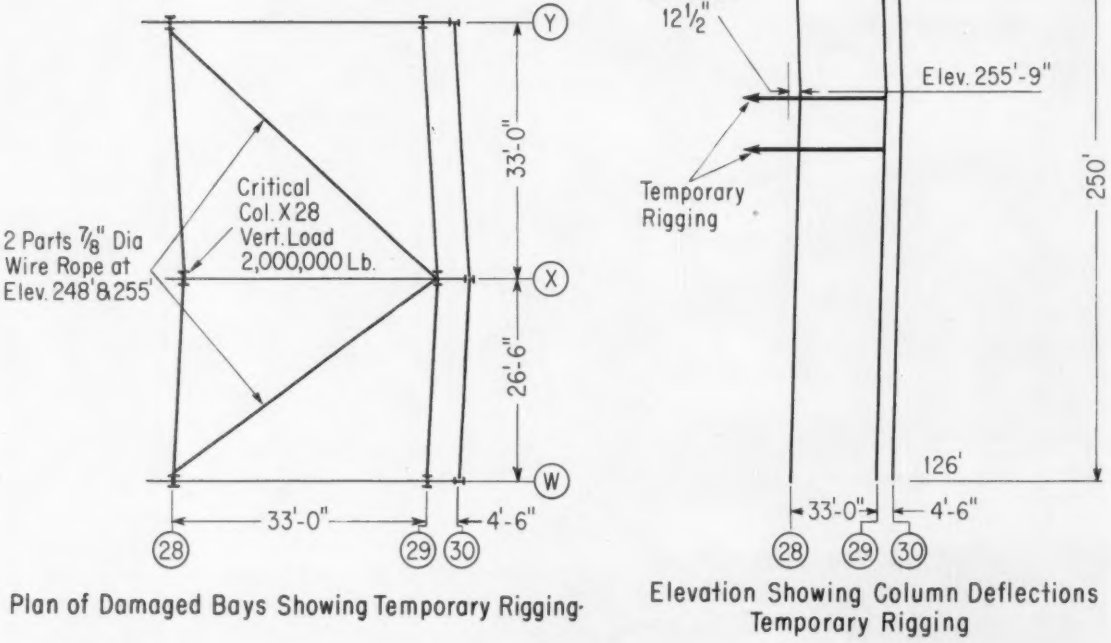
Two days later the strains were released from both sets of falls which ran through the boiler and connected to the gasoline hoists. At



BUCK STAYS, beams, and other structural members were straightened or replaced, most of them straightened. Photo shows three members removed and placed on a railroad car following the explosion of Boiler 5 at Joliet Station



Plan of Boiler Room Before Explosion



Plan of Damaged Bays Showing Temporary Rigging

Elevation Showing Column Deflections Temporary Rigging

FIG 1—BOILER ROOM PLAN shows positions of three steel columns that required straightening, temporary rigging set up in damaged bays, and the degree of deflection from vertical at the various station elevations

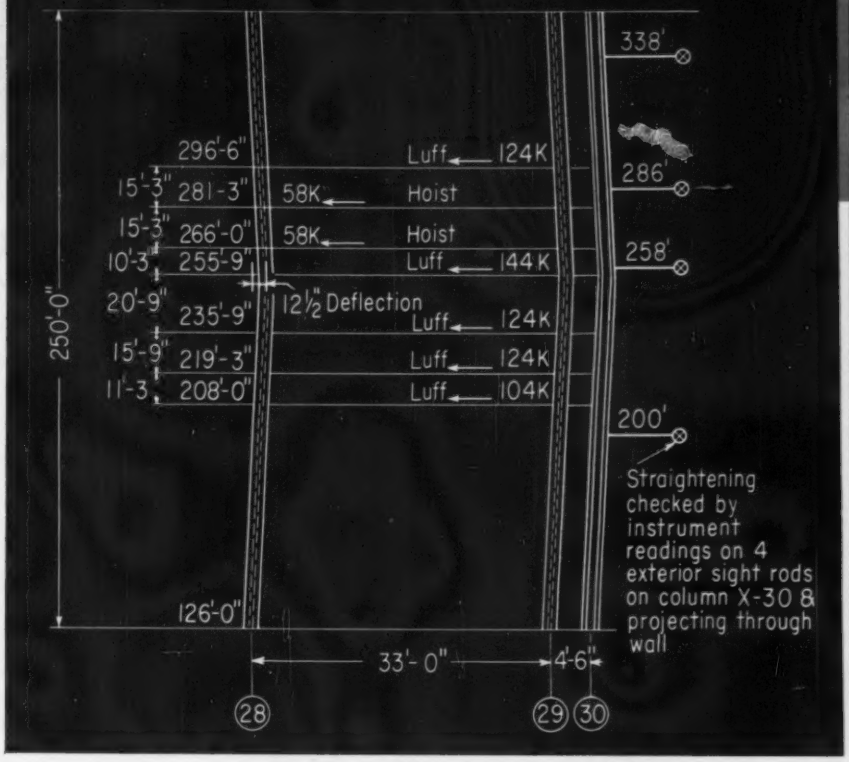


FIG 2—LUFF and hoist riggings were installed at various levels to bring three steel columns back to verticality

elevation 286 ft the column returned ½ in. to the east, and at elevation 258 ft, ⅜ in. to the east. By restoring the strain to the falls at elevation 266 ft, the losses were recovered along with an additional ⅛ in.

To avoid other losses on release of cables, permanent floor bracing was added at three elevations. The members, 6-in. tees, were welded in place after being prestressed to about 10 tons. After the permanent bracing had been installed, all cables were removed. Only insignificant movements were noted.

As the column straightening proceeded, the boiler was repaired and damaged structural steel either straightened in place with the aid of heat, or replaced.

Sample testing of 144 high-strength bolts revealed that 20 were below minimum required tensile strength as read by a torque wrench and compared with the torque tension relationship established during original erection. As a result, about 3,000 bolts in connections that had received the most movement were replaced. Evidence of distress was discovered on some removed bolts.

When the job was completed, there was no concern over the ability of the bent and restraightened steel to carry safely the design loads. Justification for this assurance was that, after an earlier explosion in another plant, a beam bowed considerably and then straightened was tested. Coupons removed from the tension flange, both before and after cold pulling, indicated that the yield point had risen from 35 to about 62 kips per sq in. with little change in ultimate strength. The result of cold pulling, the evidence showed, was a higher yield point.

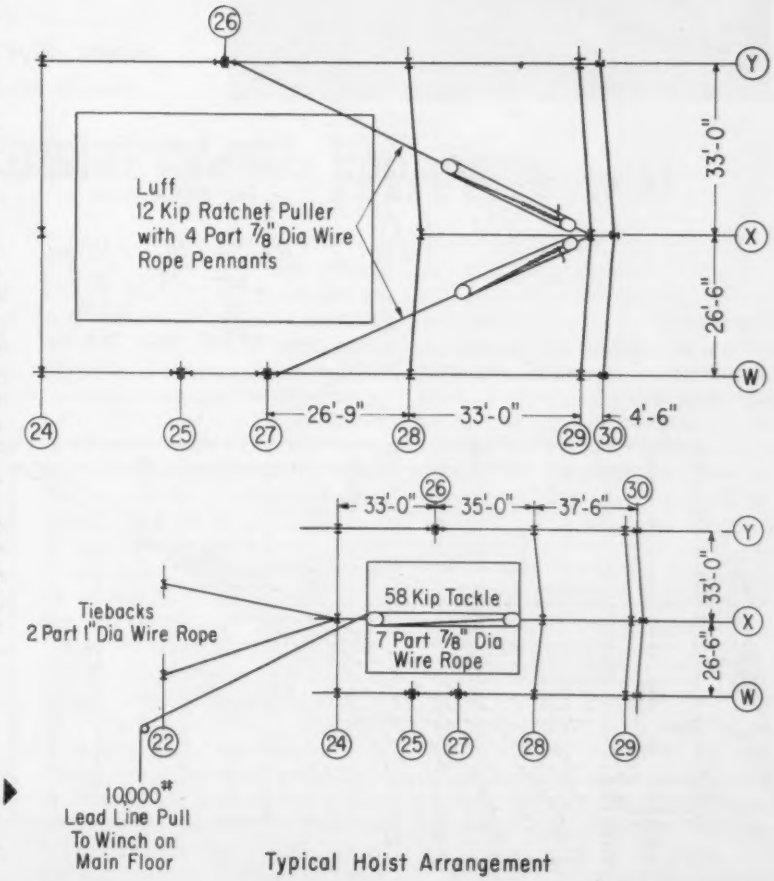
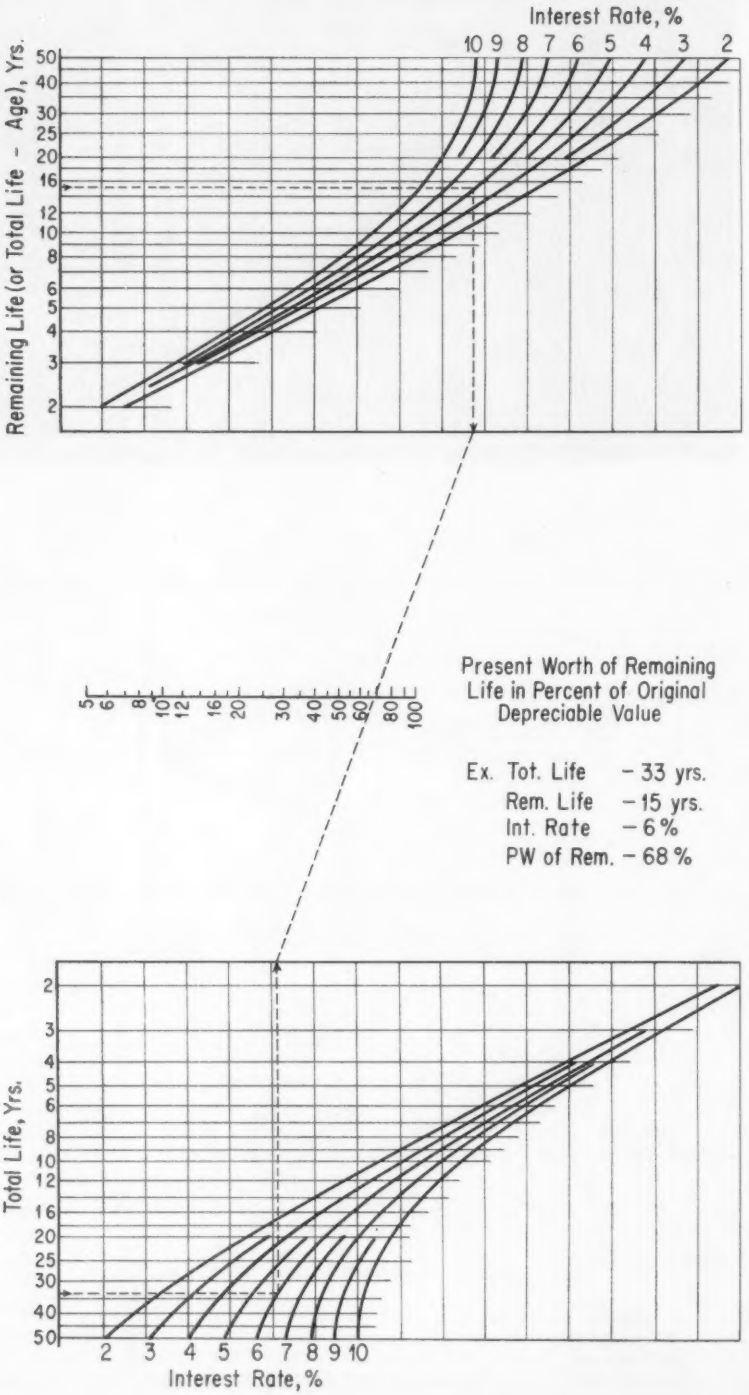


FIG 3—RIGGINGS, luff and hoist, were used for cold pulling, first on five, later on two elevations. Most deflection was at 255 ft 9 in. elevation

Typical Hoist Arrangement

How to Find Present Worth of Remaining Life of Equipment


Interest Rate, %
10 9 8 7 6 5 4 3 2
Remaining Life (or Total Life - Age), Yrs.
50 40 30 25 20 16 12 10 8 6 5 4 3 2
Present Worth of Remaining Life in Percent of Original Depreciable Value
5 6 8 10 12 16 20 30 40 50 60 80 100
Ex. Tot. Life – 33 yrs.
Rem. Life – 15 yrs.
Int. Rate – 6%
PW of Rem. – 68%
Total Life, Yrs.
2 3 4 5 6 8 10 12 16 20 25 30 40 50
2 3 4 5 6 7 8 9 10
Interest Rate, %

L. E. **MESSMORE**, Fairmont, West Virginia

A convenient nomograph can be made to determine the present worth of remaining life of equipment in percent of original depreciable value. Enter graph at remaining life, proceed across until interest rate is reached, and drop vertically to lower edge of graph.

Then enter graph at total life and repeat, rising vertically to upper edge of graph. A line drawn between the two points reached in this manner will intersect the central scale at the present worth of remaining life in percent of original depreciable value.

Example: Total life—33 years. Remaining life—15 years. Interest rate—6%. Present worth of remaining life—68%.

Kwhr Use and Billing by Month

Month	Kwhr	Dollars
Nov. '58	4,320	126.10
Dec.	4,320	126.10
Jan. '59	4,480	130.27
Feb.	5,600	159.50
Mar.	5,520	157.35
April	5,840	165.76
May	7,120	199.15
June	6,720	188.72
July	11,520	266.82
	ELECTRIC BOILER ADDED	
Aug.	17,280	277.41
Sept.	14,880	251.90
Oct.	13,120	233.19
Nov.	7,840	176.98
Dec.	9,920	199.17
Jan. '60	9,600	195.68

Kwhr billing comparison with steam generator for garment plant shows . . .

Electric Steam Boiler Proves Economy

SAM A. HALE, Industrial Sales Engineer, Georgia Power Co, Athens, Ga.

Fifteen months' experience with an electrically heated steam boiler at a Georgia garment plant clearly illustrates the economy and efficiency of the electric way. Installed to furnish steam for steam electric pressing irons, the electric boiler was selected after a careful study of the costs of other fuels. Competitive fuels considered included coal and coke, bottled gas, oil, cord wood, waste wood, and even corn cobs from a nearby grist mill. Operation of the electric boiler has been completely satisfactory. Its first cost was less than that of either a gas or oil-fired boiler. Installation costs were estimated to be about the same.

To assure the advantages of automatic or semi-automatic operation, all other fuels except oil, bottled gas, and electricity were dropped from consideration early in the study. Costs of these three were then analyzed.

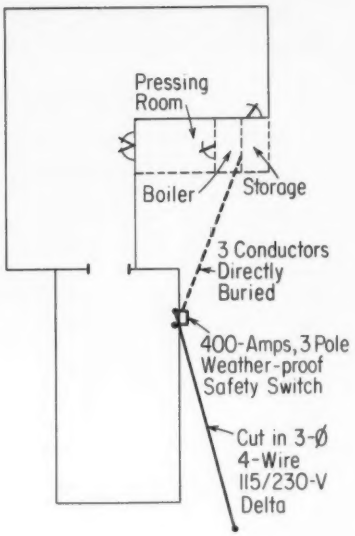
In this area, bottled gas sells at 17 cents per gallon. Net heat value is 41,584 Btu per gallon; overall annual efficiency, 60%. Converting Btu's to kwhr, the 17-cent gallon of bottled gas would produce 16.09 equivalent kwhr. At the one-cent per kwhr rate available to this customer, 16.09 kwhr would cost 16.09 cents. In addition the gas-fired boiler would require periodic cleaning and maintenance to keep its efficiency from decreasing with use. Finally, an additional investment would be needed for a large fuel tank as well as for flue and vents.

Cost of No. 2 fuel oil, with 138,000 Btu per gallon, is 15.8 cents per gallon. Overall annual efficiency of an oil-fired boiler over a period of years was 50%. The heat value of the oil would be equal to 20 kwhr or 20 cents worth of electric power. Although oil thus had a fuel cost 4.2 cents lower than electric power, this was off-set by the cost of a tank and vent, absence of soot or dirt, reduced fire hazard, and absence of any odor or by-product fumes.

To do the job properly, it was estimated that a 60-kw boiler would be needed. The heating rate applied furnished all energy for the electric steam system plus some additional energy for air conditioning at one cent per kwhr. Before the boiler was bought, the company was given an estimate of the maximum bill increase for 160 hours of operation per month.

To overcome space limitations and avoid doubling the existing 50-ton air conditioning installation, the boiler and steam presses were not installed in the existing plant. In the corner of the ell-shaped building, two new outside walls were added and roofed over to provide the necessary space. An interior wall was added to separate the pressing room opened so the spill-over heat can warm other areas of the plant.

A novel scheme was worked out to avoid the expense of replacing the



NEW 400-AMP SERVICE ENTRANCE is obviated by placing 400-amp weatherproof switch on outside wall (shown above), and running three-conductor, direct burial cable to boiler house, as shown in diagram at right

existing 400-amp service entrance. A 400-amp weatherproof switch was placed on the outside wall directly behind the main switch on the inside wall. Direct burial, 3-conductor cable was laid in a trench from the outdoor switch to the boiler house. Conduit protection was provided only for the above ground runs at each end of the cable. The 400-amp switch capacity provides for duplicate boiler in the future.

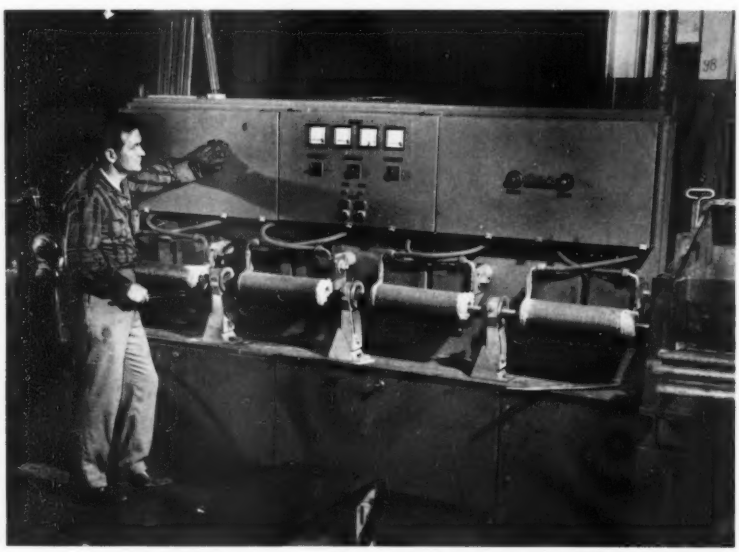
The boiler has two identical 30-kw elements, each operated at 230-v, 3-phase. Entirely automatic, it comes on 20 minutes before the plant opens each morning. Provision for manual operation with a simple toggle switch was also included. A 150-w infrared lamp keeps the boiler water from freezing on winter nights and on week-ends.

Electric Heat Does Job Five Times as Fast

A. T. PHOENIX, Industrial Power Engineer, West Penn Power Co, Washington, Pa.

On the lathe — 30 to 40 minutes. With induction heating — six to eight minutes.

These figures tell the value of induction heating in stripping operations at Rubber Rolls, Inc, of Meadowland, Pa. And, general manager R. M. Junker estimates, the heater was bought for about a third the cost of a good lathe.



The rubber rolls are used in the finishing departments of the steel, glass, printing, and boxboard industries.

Previously, a little of the underlying steel had to be turned in order to get all the rubber off. Now, the rubber roll is pulled by a motor-driven winch, first through a cutting blade, then through the induction heating coil.

Actually, two passes were made with the blade on the roll shown here; the first pass scored it, and the second cut the rubber down to the metal. It then entered the coil of the 440-v, 60-cycle induction heater rated at 20 kw.

Workers regulate the roll's passage through the heater by switching the winch off and on as needed. As the heated end comes out, the rubber covering falls free from the core.

Huge electric ore truck at open mine pit . . .

Hauls 75 Tons Up 15% Grade

A giant electrically-driven truck which may have significant ramifications for mining operations is being tested by Anaconda Co, at Butte, Mont.

Where conventional equipment has to spiral out of a pit on a maximum 7% grade, the electric truck can negotiate 15 to 20% grades at comparatively high speeds in a straight-line ramp, with additions of turns as required. Thus the truck may enable economical operation of deeper open pits than is now practical, and permit pit lay-out to conform more closely to the shape of the ore body, resulting in greatly reduced stripping ratios.

The truck may also reduce haulage distance now required for waste disposal, in favor of steep waste dumps constructed close to the pit, on top of former dumps. In remote areas, electric truck transportation will have a great economic advantage over diesel trucks where cheap power is available, and particularly where transportation of fuel thousands of miles over narrow-gauge railroads is now required.

Anaconda's year-long study, scheduled for completion in April, 1961, is seeking data on the most efficient loads, grades, speeds, and power requirements for the truck, a prototype by R. G. LeTourneau.

At the Butte test operation, the truck is loaded by electrically-powered shovels and then proceeds by a 350-hp diesel engine to the bottom of a 1,600-ft trolley. The truck operator connects the vehicle to the trolley and "pours the power" into the truck, hauling it and its 75-ton load smoothly up a specially-built 15% grade roadway at about 10 mph. At the upper end of the run, the driver lowers the trolley pole and drives to a nearby dumping area under diesel power. The return run is made without the trolley.

Energy is supplied by Montana Power Co at 2,400 v to an Anaconda-owned rectifier. Lines from the rectifier energize the double circuit trolley at 600 v dc.

Each of the truck's wheels has a

What's Your Production Problem?

If you have problems in lighting, drying, casting, forging, painting, or materials handling, consult your local power company. Let their experienced specialists show you how to cut costs with electric power.

◀ **DUMPING LOAD** after uphill run, truck operates on diesel power

400-hp, 600-v dc motor, making a total of 1,600 hp available. In the loading and dumping operations, when the trolley is not used, the motors are supplied from a dc generator driven by a 335-hp diesel engine. Auxiliaries are supplied from an ac generator powered by the same engine. Steering as well as dumping is accomplished with ac motors operating on a rack and pinion. Some changes, such as automating the raising and lowering of the trolley pole, are now being made.

Cost of maintenance, another factor under study, is expected to be considerably lower with electric drive, since vibration will be minimized, reducing the strain imposed on the vehicle.

The tests appear to bear out Anaconda's concept of an electric truck which surpasses performance characteristics of the most powerful diesel engine operated truck. The truck has already doubled the operating speed on adverse grades, and more than doubled the angle of the grade which can be ascended. Ultimately it is expected to double its load capacity as compared with the largest pit trucks now in operation. In fact, Anaconda thinks it not unlikely that the truck's ultimate duty will approximate three times that of present equipment.

High-Frequency Welder Speeds Pipe-Making

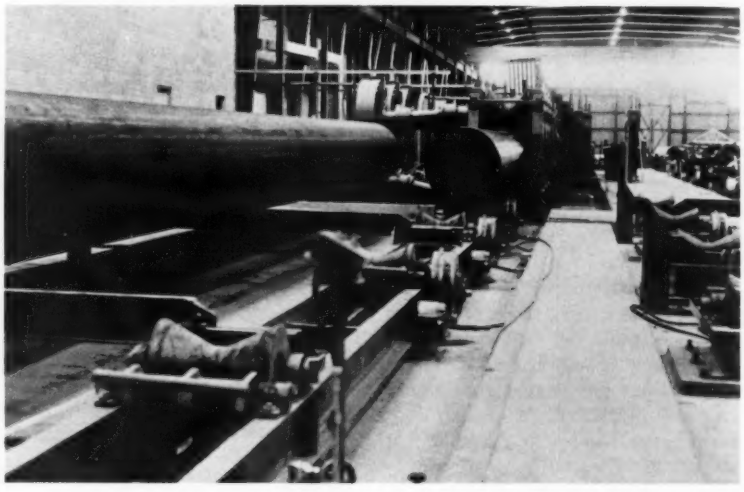
A high-frequency resistance welder in a pipe mill near Calgary, Canada, is turning out 18 to 36-inch O.D. hot rolled steel pipe at speeds up to 50 ft per minute.

The welder, at The Big Inch Pipe Corp, Ltd, produces oil, gas, and water transmission line pipe with wall thicknesses of $\frac{3}{16}$ to $\frac{5}{8}$ inches. Production speed for $\frac{1}{2}$-inch wall pipe exceeds 35 ft per minute, with a possible speed of 50 ft per minute.

The Thermatool welder obviates sand-blasting or pickling to remove scale and oxidation. Using no flux or other metal, the operation produces a forged weld which has uniform strength and has been proven stronger than the basic metal under the most severe tests.

Flash and splatter in high-frequency resistance welding is negligible, eliminating costly cleaning. The bead formed by the upset during welding is comparatively small and scarfing is easily accomplished. Also, the mill can be operated by five or six men, where 18 or more are needed by conventional mills.

In the Big Inch operation, 60-ft lengths of steel plates are trimmed to required width, then fed into the forging mill which brings the formed open seam to the welding head. Here



it is forge-welded by high-frequency electric resistance, scarfed inside and out, sized and then delivered to the run-off table.

The high-frequency resistance welder makes possible continuous welding by introducing 400,000-cycle-per-second current directly into the metal via two small sliding contacts which ride one on each side of the open seam.

The open seam of the pipe is kept in an elongated "V" form as it nears the welding head. The two sliding contacts, riding a few inches from the root of the "V," introduce the high-frequency current directly into the metal. The current from one contact flows down one side of the "V" to the root and back along the outer edge of the open seam to the other contact. Each contact acts as a return for the other. The heat-effected zone is smaller than in most welding processes, since only the edges of the open seam are heated to welding temperature, and very little heat is dissipated in adjacent metal.

23% Lighter
25% Smaller

NEW GENERAL ELECTRIC 500-KVA DISTRIBUTION TRANSFORMERS OFFER GREATER CAPACITY IN LESS SPACE

Now you can mount three 500-kva distribution transformers in the same space formerly required for three 333-kva units. This 500/560-kva unit is only 61 inches tall, and its total weight has been reduced to 3000 pounds. Similar weight and size reductions apply to other 500-kva ratings as well as 250- and 333-kva sizes.

Operating characteristics have been improved too. Total losses have been lowered as much as 13 percent. And, you get the extra 12 percent kva capacity of General Electric's Permalex* transformers, increasing the installed kva capacity of a 500-kva unit to 560 kva, or the capacity of a bank of three 500-kva units to 1680 kva.

Find out about the significant savings that are yours when you use General Electric large distribution transformers. For details, see your General Electric Sales Engineer or write to Section 483-05, General Electric Co., Schenectady 5, New York.

** Reg. Trademark of General Electric Co.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

Smaller, Lighter, More Efficient Transmission-tie Power Transformers

Specify General Electric bushing-mounted LTC and eliminate the extra, series transformer in units 120,000-kva and above

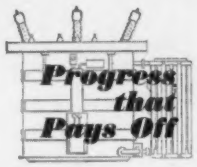
Power transformers which are up to 10% lighter and smaller, and have as much as 15% lower losses are available for your transmission-tie applications, 120,000-kva and larger, above 69 kv. These smaller, lighter, more efficient General Electric units utilize bushing-mounted load-tap-changing (LTC) equipment.

Conventional, large LTC equipment normally requires an auxiliary, series transformer next to the main core and coils to reduce insulation requirements. Locating the load tap changers atop the bushings means the series transformer, with its size, weight and losses, can be eliminated.

NEW TREND?

The first General Electric bushing-mounted load tap changers were installed in 1943. However, since 1957, 21 G-E power transformers with these load tap changers have been delivered or ordered. Units rated 300,000 kva are in service; others rated 345 kv are being built.

FOR MORE INFORMATION about General Electric bushing-mounted load tap changers, contact your G-E sales engineer. Or, write for Bulletin GEA-7133, to General Electric Company, Section 421-60, Schenectady 5, N.Y.

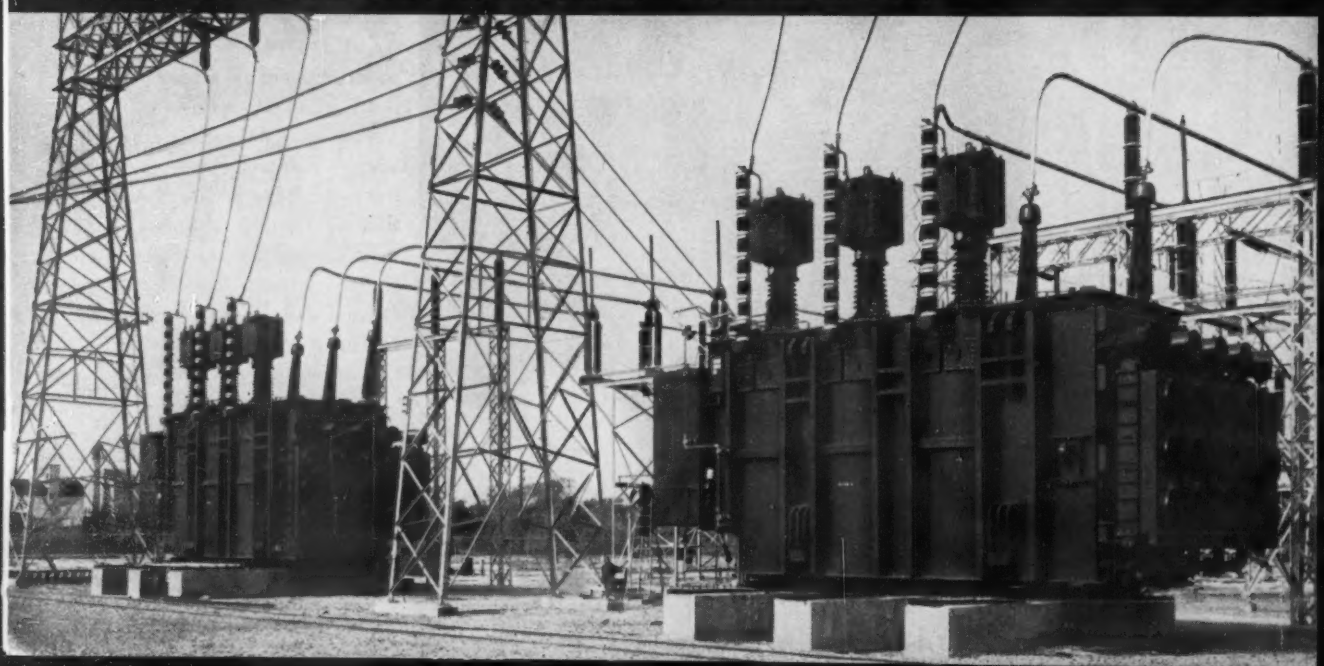


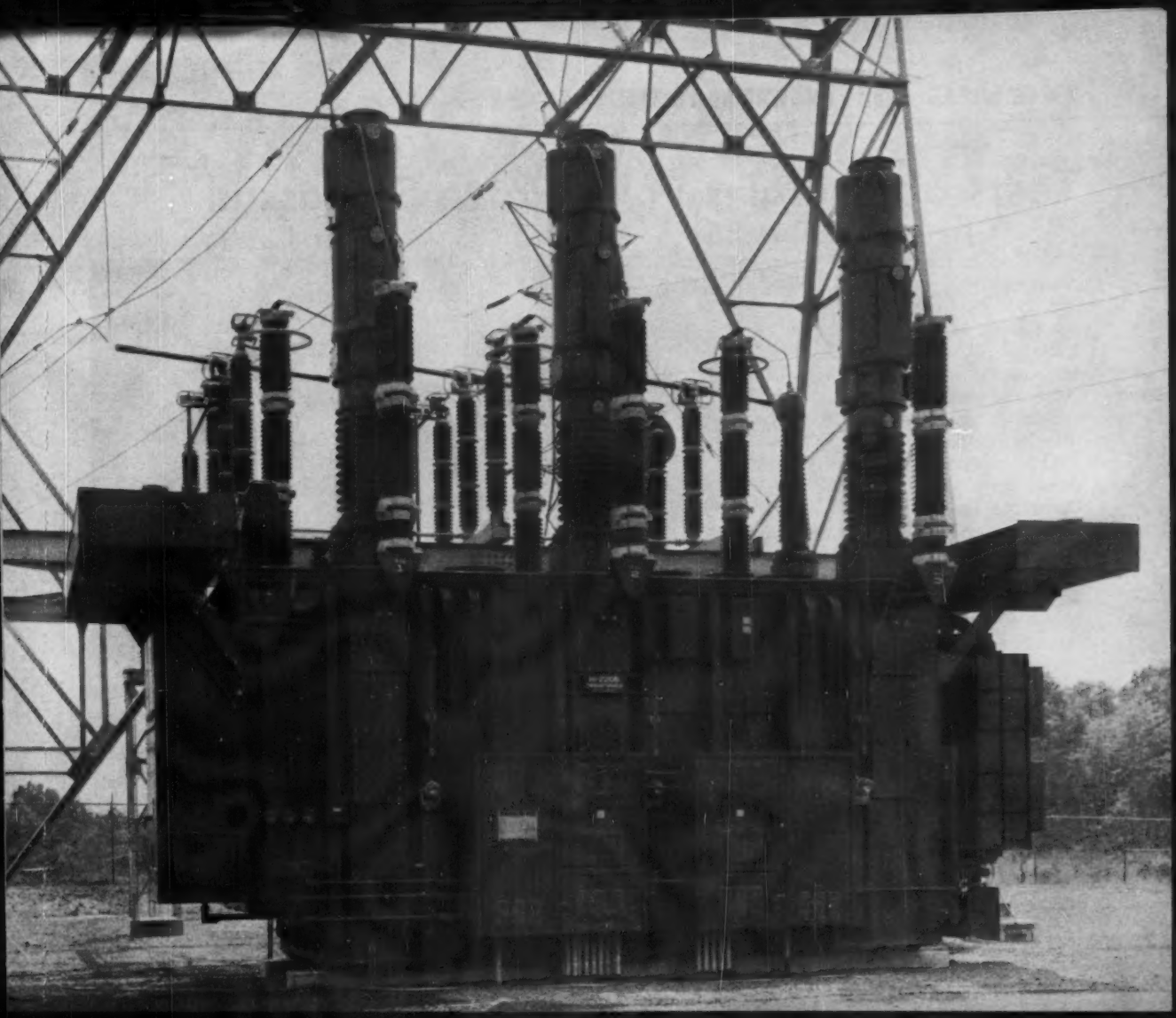
Progress Is Our Most Important Product

GENERAL ELECTRIC

Higher-rated transformers—such as this 300,000 (output)-kva, 230-kv unit at the Trenton Switching Station of the Public Service Electric and Gas Co., N. J.—utilize the LR-41 LTC mechanism.

The medium-duty General Electric LR-69 bushing-mounted load-tap-changing mechanism is used on these 125,000 (output)-kva, 230-kv transformers at the Gardenville substation of the Niagara-Mohawk Power Corp.





TYPICAL SAVINGS WITH BUSHING-MOUNTED LTC

	CONVENTIONAL LTC	BUSHING-MOUNTED LTC
Rating: FOA-T-60-250,000 (output) kva-230 kv-115 kv		
LENGTH	450 INCHES	410 INCHES
WIDTH	295 INCHES	300 INCHES
WEIGHT	521,000 POUNDS	488,000 POUNDS
TOTAL LOSS	820 KW	736 KW
Rating: FOA-T-60-200,000 (output) kva-345 kv-115 kv		
LENGTH	485 INCHES	435 INCHES
WIDTH	340 INCHES	340 INCHES
WEIGHT	650,000 POUNDS	595,000 POUNDS
TOTAL LOSS	975 KW	837 KW

Tests of Fiberglas Poles Prove Successful

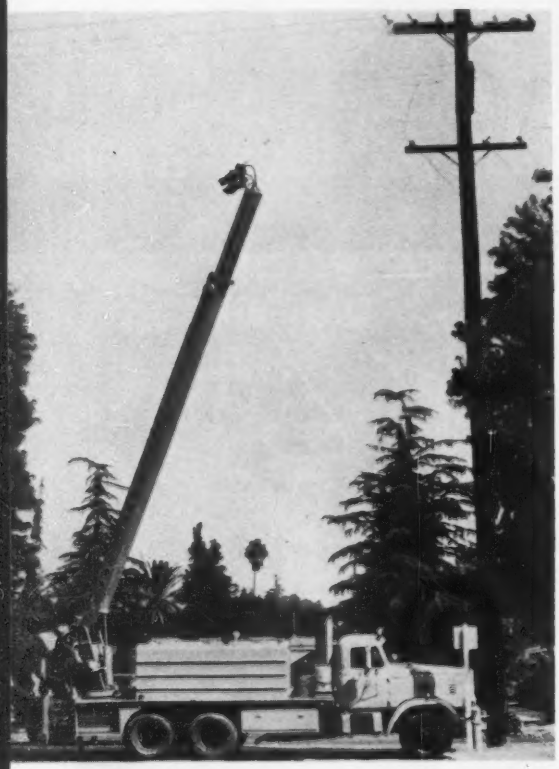
Box score on the 11 Fiberglas poles and arms installed in February, 1955 by Consumers Power Co near Alma, Mich., (EW, March 5, 1956, p 79) totals: some weathering, one hit, but no errors. The poles and arms in the 4.8-kv line are being inspected from time to time by company personnel (right).

Only noticeable change in the poles, upon latest inspection, was the appearance of a chalky white substance on the surface of the mahogany-colored poles, principally on the windward side. This whitish substance, says the utility, probably is due to weathering of the epoxy resin bonding agent.

One pole sustained a collision with a heavy vehicle, probably a bulldozer or plow. However, this pole is still standing.

The other poles and crossarms are in good condition. No damage has occurred from burning due to leakage currents or from lightning. The distribution line is in an area where the isoceraunic level is 35 storm days per year. As was anticipated, no damage from woodpeckers has been experienced.

The poles and arms were installed by Consumers Power to test the possibilities of Fiberglas components. The hollow 35-ft poles, capped at both ends, weigh 150 lb each. Galvanized fittings were used.



Lighter Weight Pump For Insulator Washing

Southern California Edison Co is using a lightweight, four stage centrifugal pump specifically designed for washing insulators in service. It can also be adapted for tower washing.

This High Line Model 2500 is installed on a Pittman telescopic insulator washer boom (left) which raises the hose to the desired height before water is forced onto the insulators. Either a 65 or 75-ft boom is used.

Because the washing unit weighs only 185 lb, the truck can carry 1,800 gal of water instead of 1,200 gal previously allowed through use of a heavier unit, says the manufacturer, Continental Pump Corp, Arcadia, Calif. Approximate working time of the equipment is 8 to 16 hr per day.

A full torque power take-off provides power for pressures in excess of 1,000 psi. The pump is adaptable to any of the truck chassis now used by the utility.

(*More News of Manufacturers on page* 74)

It's This "One-Piece" Jaw...

That Does the Trick in FARGO Automatic Line Splices

And Here's Why:

Precision machining of the "one-piece" jaw from solid bar stock assures *permanent alignment* of jaw segments, which prevents individual strands of the conductor from getting out of place.

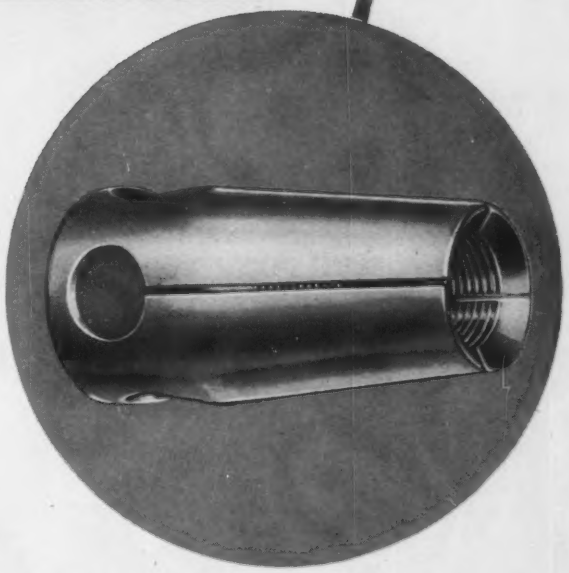
Because of "one-piece" construction, jaw segments flair out slightly as the wire is inserted to give an excellent initial grip on the wire.

The entire jaw assembly and conductor move forward as a unit when tension is applied to complete the grip—so it can't let go!

The "one-piece" jaw permits a liberal safety zone to be machined into the back of the jaw to accommodate burred ends of the conductor.

For copper conductors the "one piece" jaw is machined from durable silicon bronze . . . for aluminum and aluminum alloy conductors from a high strength aluminum alloy for a strong, permanent, corrosion resistant grip on the conductor.

Ask your Line Material Field Engineer for complete details.

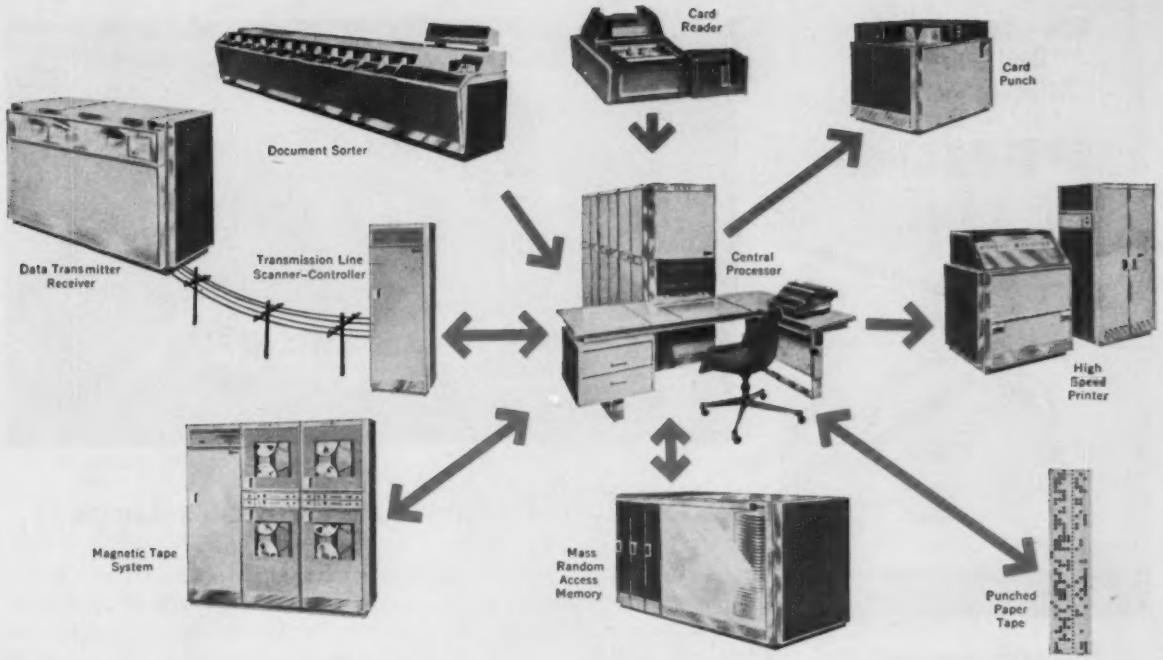


Fargo Automatic Line Splices . . . Reducing Splices . . . Automatic Dead Ends are available in copper and aluminum for copper, Copperweld, aluminum and aluminum alloy conductors for a complete range of sizes.

Distributed by
LINE MATERIAL INDUSTRIES
McGraw-Edison Company
Milwaukee, Wisconsin
In Canada, CLM INDUSTRIES, Toronto 13, Canada

Manufactured by
FARGO MFG. COMPANY, INC.
Poughkeepsie
New York

NEW GENERAL ELECTRIC GE 225 INFORMATION PROCESSING SYSTEM... OFFERS YOU SYSTEM FLEXIBILITY FOR...



DATA MATING PERMITS WIDE USE OF ANY OR ALL MAJOR INPUT-OUTPUTS...A MULTITUDE OF JOBS AT LOWER COST

• New GE Data Mating permits simultaneous operation of every major peripheral device while computing. Result—the new GE 225:

performs a multitude of jobs at much lower cost.

provides greatest efficiency—maximum utilization of machine time.

allows low cost input-output additions and substitutions.

permits many varying and money-saving applications within one organization—including minimum cost conversion.

• Data Mating enables GE 225 to be teamed with new MICR documents, punched cards, punched paper tape, magnetic tape, mass random access memory, drum memories, high speed printer, typewriter, high speed transmission lines.

• High speed operation—25,000 five-digit additions per second.

• Compactness and low power requirements reduce cost of installation, site, air-conditioning, operation and maintenance.

• Practical for use in smaller firms where computer operation has heretofore been unfeasible.

• Full range of services available—programming aids package, training and consultation, back-up computer centers, and maintenance program.

For more detailed information, write today for brochure CPB-101 on the new GE 225 Information Processing System. Also available: brochure CPB-81 on the GE 210 Data Processing System.

Write to: General Electric Company • Computer Department • 13436 No. Black Canyon Highway • Phoenix, Arizona.

Progress Is Our Most Important Product

GENERAL ELECTRIC

CPA-35(11-60)

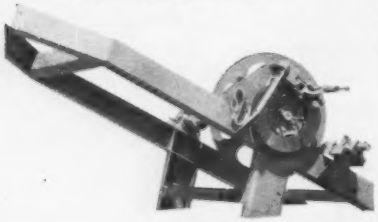
General Electric—A pioneer in computer systems for all phases of business, industrial, scientific, engineering, and financial endeavor.

Now—Convert your own Reel Dolly to a Bullwheel Tensioner WITH A

PENGO 5000-U Assembly

5000-U assembly installed by City of Medicine Hat, Alberta, Canada

Here's an easy way to build up a modern bullwheel tensioner at low cost—simply install a PENGO 5000-U Bullwheel Assembly to your old trailer or reel dolly. You'll have a tensioner with Neoprene-lined 26" bullwheels, capable of handling practically any distribution line stringing job at tensions to 2,000 lbs. at up to 4 mph.



Support arms, reel spindle with reel brake, and hand rewind assembly. 2⅝" spindle will handle reels to 75" diameter, 44" width unless reduced to fit your trailer.

Bullwheel and tension brake assembly may be purchased separately.

We invite you to write or wire for literature, prices—please address Dept. 124.

PETERSEN ENGINEERING COMPANY, INC.
Santa Clara, California
Phone: AXminster 6-7712

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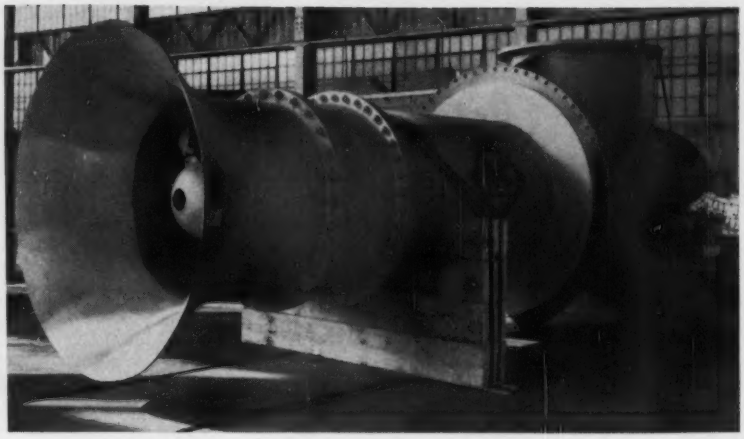


Axial Flow Pumps Are Canada's Largest

Destined for condenser circulating water use at Ontario Hydro's Lakeview generator station, this axial flow pump was recently shipped from Canadian Allis-Chalmers, Ltd's Lachine Works. According to A-C, this and three other pumps to be supplied to the plant will be the largest in Canada.

The four pumps have a 90-in. suction and 60-in. discharge axial flow with a nominal rating of 100,000 gpm (US). They have a 24-ft head, powered by 800-hp motors.

Total weight of each pump, exclusive of the motor, is 21 tons. Pump and motor, complete, weigh 27 tons.

Loss Indicated for I-T-E's Third Quarter

I-T-E Circuit Breaker Co reports for the third quarter indicate loss of $83,500, compared with $1,078,500 profit for the same period in 1959. Shipments fell to $26,512,000 from $31,126,660.

W. M. Scott Jr, president, attributed poor showing to unusually low prices for most electrical power equipment products and writing-off of "substantial losses" by the non-electrical division. Switchgear in recent weeks has been showing "encouraging signs of price improvement," he pointed out. "However, oil circuit breakers continue to reflect prices at virtually bottomless levels," he said.

Manufacturers Literature

CONSTRUCTION . . . and bulk materials handling equipment. Describes tractor shovels, tractor dozers, tractor scrapers, tractor loggers, and excavator cranes. On-the-job photographs of equipment in action. Bulletin 150A, 28 pages. Machinery Div, Clark Equipment Co, Pipestone Plant, Benton Harbor, Mich.

POWER TRANSFORMER . . . REGU/TRAN unit assembly for load tap-changing flexibility. Three single-phase regulators mounted on 3-phase power transformer with three by-pass switches above regulators. Bulletin No. 61B9695, six pages. Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

AUTOMATION . . . for electric utilities, general description of design, manufacture and application of electrical components. Practical aspects of uses of automations in some areas of electric utility operation described. Booklet, 24 pages. General Electric Co, 1 River Rd, Schenectady 5, N.Y.

ELECTROMAGNETIC DRIVES . . . for conveyors, fans and pumps, winders, and wherever need exists for speed control. Air-cooled, both integral and fractional, and liquid-cooled units. Booklet B-7875, 12 pages. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

PEABODY Supplies Coal To Many Of America's Leading Electric Utilities

At breakfast this morning, when that rich golden-brown toast was served and its wonderful aroma drifted up from your plate . . . you probably didn't realize that every morning, 1,032 tons of coal is used to make the nation's toast.

Day and night . . . in our homes, offices and plants—in countless ways . . . coal serves us by generating dependable, economical electrical power. Coal's importance to the nation is best emphasized by the fact that *coal* generates more electricity than all other fuels and water power *combined.* Peabody Coal Company . . . with two billion tons of proven reserves . . . supplies many of the nation's electric utilities that bring you efficient, dependable power . . . at a price you can afford to pay.

The next time you butter your toast . . . or turn on a light—or watch television . . . think of coal and the great electric utilities that serve you.

Learn more facts about Peabody Coal . . . its importance to the nation's economy and your business. Send for Peabody's new FREE booklet, "COAL . . . ANCIENT STOREHOUSE OF MODERN LIVING." Write Department EW.

power for progress

PEABODY COAL COMPANY

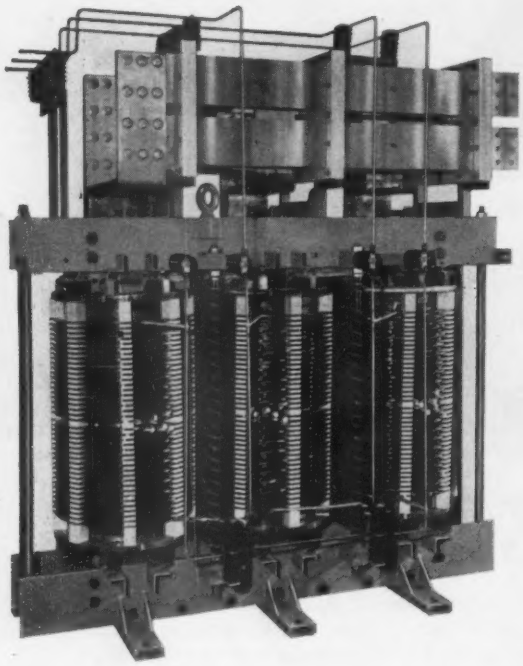
Peabody Plaza • 301 Olive Street • St. Louis 2, Missouri

Offices in: Chicago, Columbus, Des Moines, Detroit, Indianapolis, Kansas City, Louisville, Madison, Wis., Memphis, Minneapolis

Potential Transformer . . .

. . . **for 600-v applications** is designed for indoor and outdoor metering. The T-6 is encapsulated in colored epoxy resin and mounted on a heavy aluminum base plate. Color coding indicates standard ratios. Primary and secondary terminals have solderless connectors. Accuracy classification is 0.3 for W and X burdens as well as for burdens of two watthour meters, phase-shifting transformer and demand register. Impulse level is more than 10 kv full wave.

Sangamo Electric Co, Springfield, Ill.

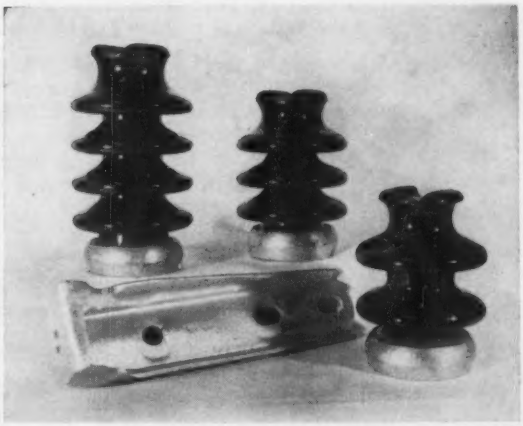


Dry-Type Transformers . . .

. . . **are available for indoor installation** in plants, schools, hospitals and public buildings. Design operates at 4 to 5 decibels below 1960 NEMA standards. Class B units are supplied in single and 3-phase construction. Single-phase units are offered in voltages up to 15 kv with kva ratings from 3 through 500. Three-phase units are offered in same voltages with kva ratings through 2,000. Higher kva ratings are available.

Niagara Transformer Corp, Buffalo 25, N. Y.

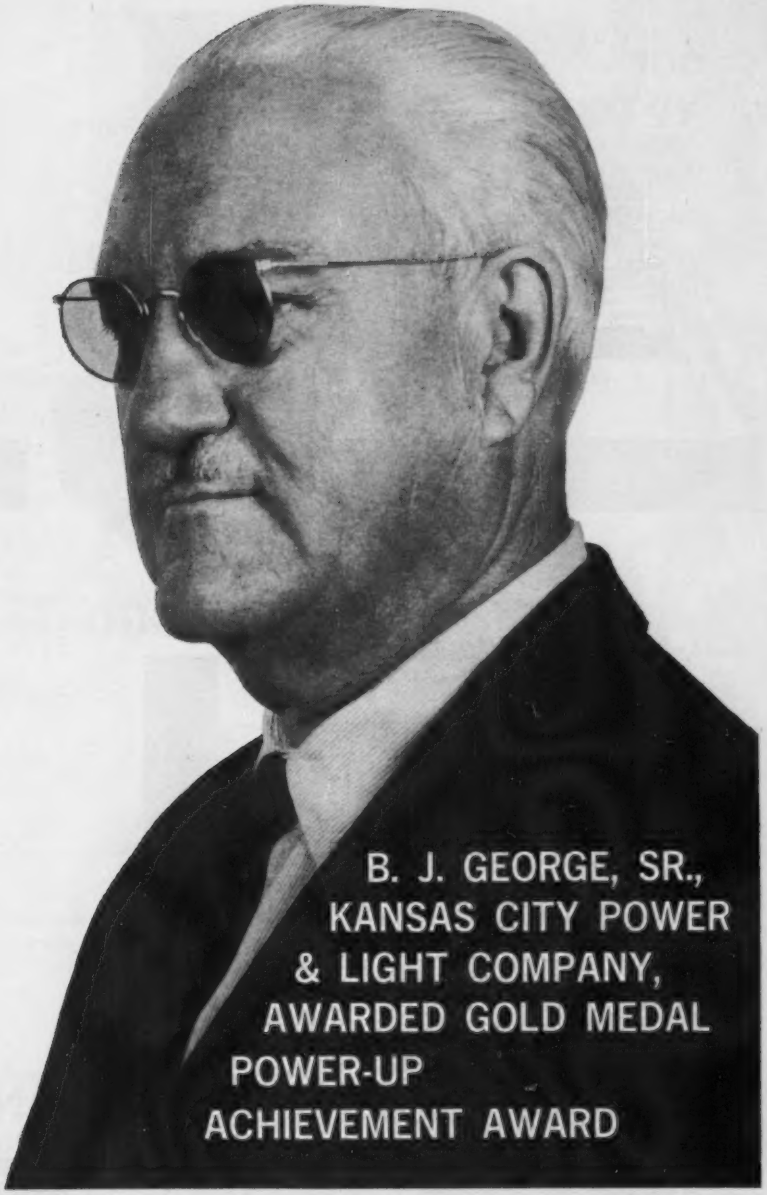
Post Insulators . . .



. . . **for 15 kv distribution** match in characteristics and appearance the 20 and 27-kv post insulators previously available. Units feature a solid porcelain post cemented into a galvanized steel base. They are free from radio and television interference without coating, treatment or attachment. Fog-type petticoats provide best operations under contamination conditions. A light-weight pole top bracket provides a strong, economical mounting.

Lapp Insulator Co, Inc, LeRoy, N. Y.

(*More New Equipment on page* 79)



A POWER-UP Achievement Award

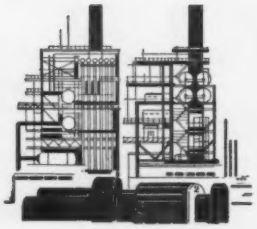
Increasing load on a customer's 1925 d-c generating plant posed a difficult problem for Mr. B. J. George, Sr., Kansas City Power & Light Company consultant. Should additional d-c capacity be provided . . . or new a-c generating equipment installed? Should all major load power be purchased? Should steam or electricity be used for air conditioning? Mr. George's solution earned him the Gold Medal Power-Up Achievement Award.

Working closely with the customer, consulting engineers, contractors and fellow employes, Mr. George recommended all purchased power except for boilers to provide building and water heating. Four substations were installed, along with a new a-c distribution system to serve lighting, small motors, office equipment and the conversion of loads to the new system. The customer now has ample provision for future load growth.

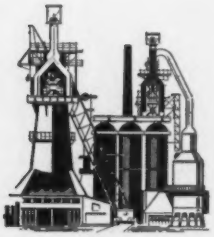
Bronze Medal Power-Up Awards were won by Raymond J. Bergmann, The United Illuminating Company (New Haven, Conn.); William J. Carkeek, Puget Sound Power & Light Company (Bellevue, Wash.); William F. Doherty, Union Electric Company (St. Louis, Mo.); Louis E. Krieg, Jr., Pennsylvania Power & Light Company (Allentown, Pa.); Bernard M. Lyons, The Cleveland Electric Illuminating Company; Paul H. Rickert, Metropolitan Edison Company (Reading, Pa.). The awards were based on the sum total of each man's effort, including the results to the customers, the extent of cooperation within the Power-Up teams and that gained from architects, consultants, contractors and manufacturers.

The seven award winners typify the power sales engineers who perform a vital role in helping America increase productivity through electrification. The Power-Up Achievement Awards are presented annually in recognition of outstanding service to industry. Power-Up is a program of electrical service sponsored by the Westinghouse Electric Corporation. You can be sure . . . if it's Westinghouse. J-97251

Westinghouse

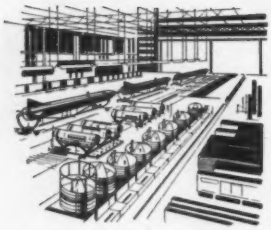


ELECTRIC POWER

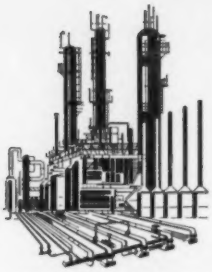


STEEL

RW-300



AIRCRAFT AND MISSILES



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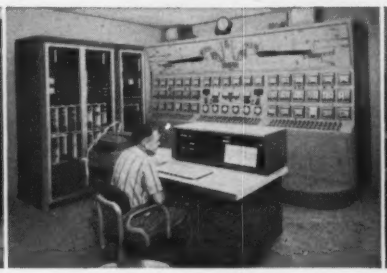
Federal Aviation Agency, Atlantic City, New Jersey—air traffic control simulation



Riverside Cement Company, Oro Grande, California—cement manufacturing

Douglas Aircraft Company, Santa Monica, California—missile component testing

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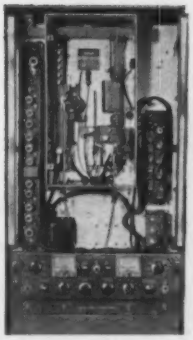

Microwave Set . . .

. . . for high-speed data transfer also transmits telephone and teletype-writer messages. The 12,000-Mc model MR-40 is a broad-band transmitter-receiver set that carries data at 62,000 character per sec with 100 mw power output.
Motorola Inc, 4501 W Augusta Blvd, Chicago 51, Ill.

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. . . for circuits above 9 kv spaces conductors on 7-in. centers. The Tri-7 Henrdi-Clamp accommodates conductors to 1½ in. dia with split neoprene bushings whose inside diameters fit specific conductor and messenger sizes.
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. . . for boiler feedwater systems remove non-condensible corrosive gases down to 0.005 ml oxygen per liter of water and zero CO_2. The counter-flow design meets variations in load from 0 to 100% of rating with as little as 30F temperature

(*Continued on page* 82)

NEW 3/4-ton Pull-A-Way
Added to WRIGHT TYPE "C" LINE!

FOUR SIZES • ¾, 1½, 3 and 6 Tons

FEATURES
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...For Locating Faults in Lead-Covered Cable ...For D-C Proof Testing

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8-1005 **Write for Bulletin 65-W**

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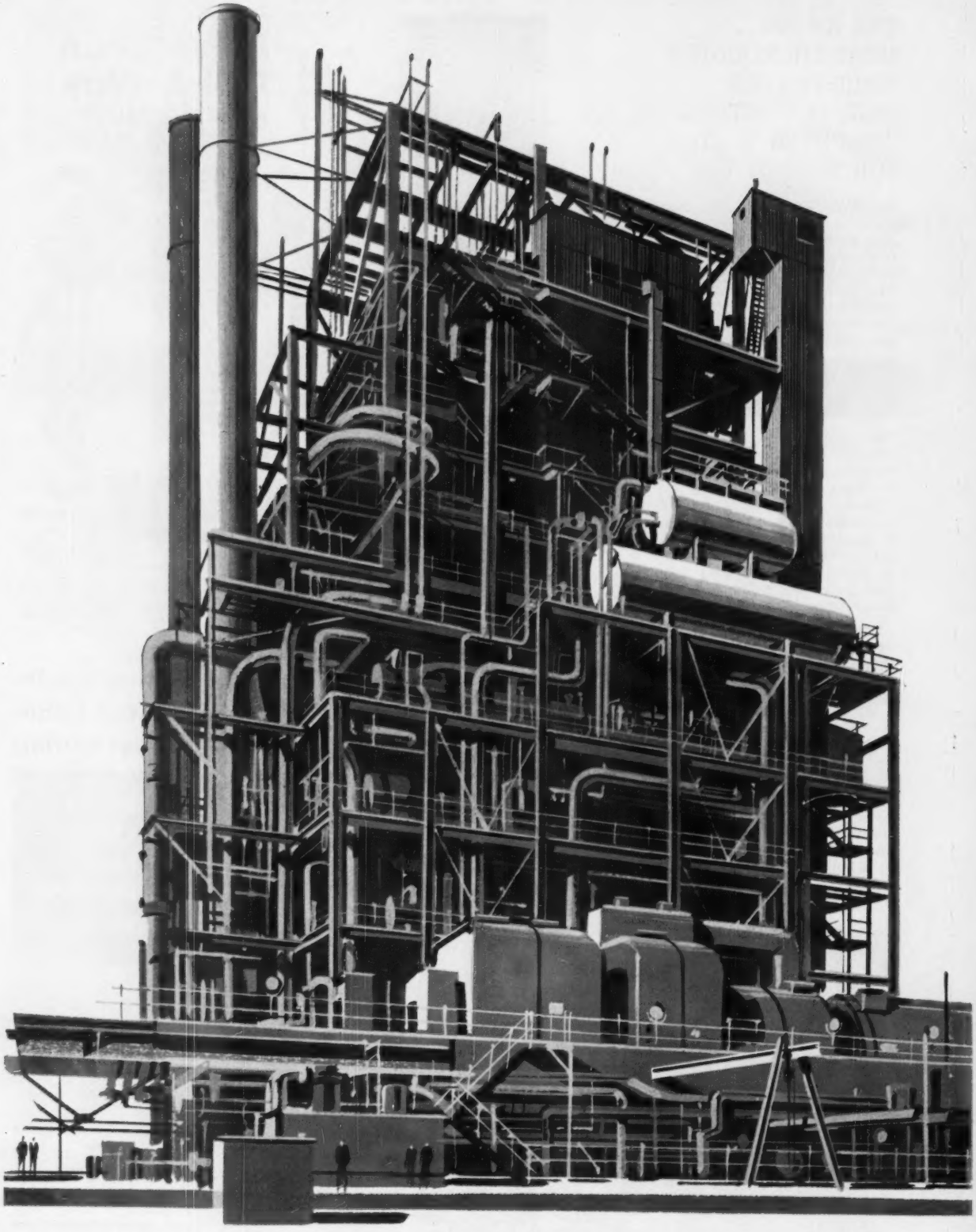

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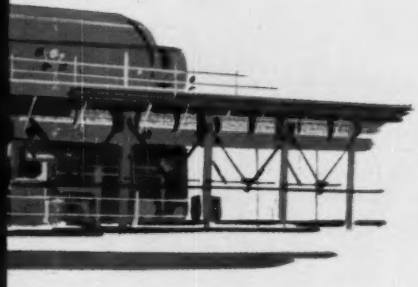

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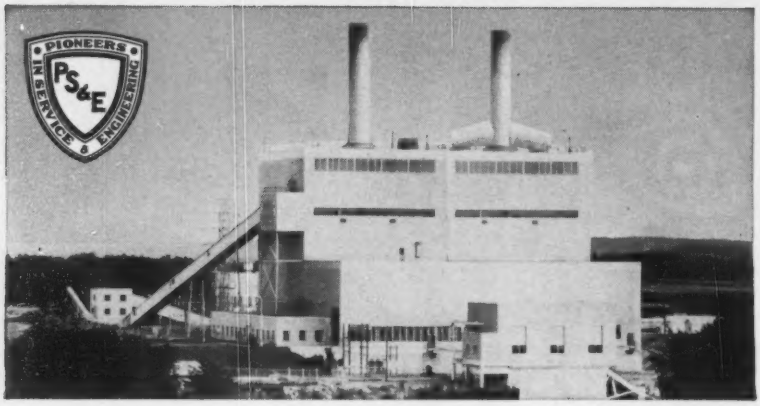
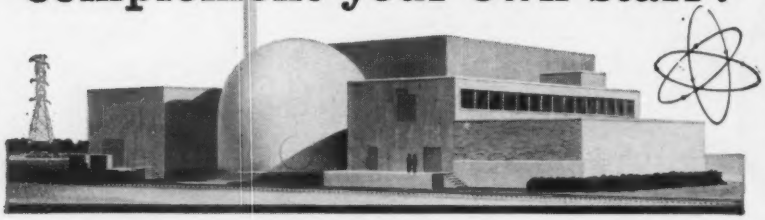
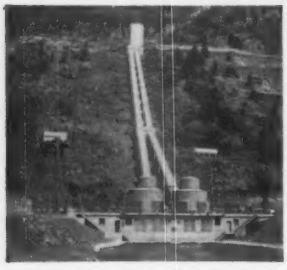
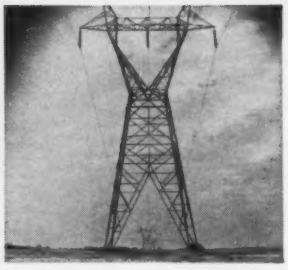


Which Pioneer service do you need to complement your own staff?







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(*Continued from page 79*)

rise at any supply-steam pressure from ½ psig up. Water-contacting internals are of stainless steel.
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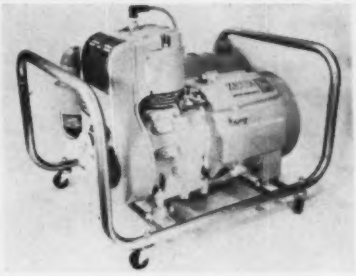

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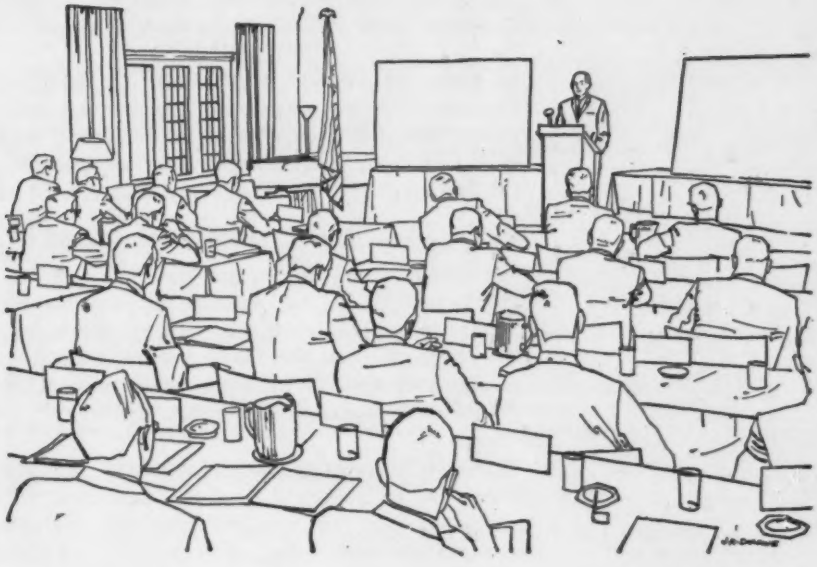
Vertical Motors . . .

. . . in frame sizes 364UP to 445UP is redesigned to increase horsepower and life, decrease maintenance and dimensions. HSHG vertical hollow shaft motors are of open dripproof, high-thrust construction, with a lightweight aluminum top cover.
Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

Electrical World

November 28, 1960

Management Newsletter



Tomorrow's leaders from 25 New England utilities study management skills as ECNE launches first training program for . . .

Middle Management—Seedbed for Executives

How should a utility train its middle management group, the men from whom the top management positions of tomorrow's utilities will be filled? Utility officers themselves have ample opportunity for formal management training in programs like those of the American Management Assn and in a wide variety of summer courses at universities throughout the country. Similarly, many utilities have their own programs for training foremen and supervisors in the techniques of handling people, keeping them happy, and showing them how to work more efficiently.

But for the middle management group, training opportunities are much more limited. Management training programs specifically for them are rare. Of course, many utilities, in their broad-gauged personnel training programs, attempt to include this level of management. But the needs of these men are somewhat different from those of lower levels for whom such programs are primarily designed. In fact, what middle management needs to learn is similar in scope and content to programs designed for the top executives. It includes such basic management skills as: forecasting, planning, organization, selecting staff, reviewing and appraising, establishing and maintaining controls, teaching and coaching, and—perhaps most of all—communication.

Why the great concern about this level of management? One reason is the large role it plays in utility operations and decisions. For though middle management is a minority among total utility employees, it is a large and influential minority. Its members comprise an extensive horizontal net that reaches into every department and operation. And they make a large proportion of the short-range decisions on which the utility's welfare depends. Moreover, it serves as an

incubator and training ground for tomorrow's top executives—the men on whose efficiency and training the vitality of the whole structure will depend.

How then can a utility best equip these men with the essential skills required both for their present role and for their future responsibilities? One solution, and apparently a very successful one, is the regional training program under the sponsorship of a utility organization. At least, this is the experience of the Electric Council of New England (ECNE), which just finished its first such venture—a one-week "skills of management" program for middle management in New England utilities. And according to both sponsors and "students," it turned out to be a whopping success.

Of course the program didn't spring into being overnight. A number of New England utility executives had long felt that both their companies and their men would benefit if an intensive skills-of-management program could be designed to the next lower echelon. Some companies, notably Connecticut Light & Power Co, had conducted similar—but more specialized—programs of their own.

But it was the formation of ECNE, bringing together 48 investor-owned utilities, that finally started the program moving on a broad scale. Three years ago, shortly after ECNE was founded, its employee relations committee started to look at methods of appraisal, selection, and training of management personnel in its member companies. Some had well-defined programs. Most did not. But all were interested. So a five-man sub-committee was set up under the chairmanship of J. R. Maher of Connecticut L&P.

Theme of the program was, "Management is a profession—it can be learned." Maher and his cohorts decided that the course would first identify these skills, then expand on their use and value with individual speakers. They planned to allot a full week to the course and work the students from 8:30 am to 9 pm. But even then they realized there would not be enough time to go deep enough.

In setting up the project, the planners aimed high. They wanted a top-notch, professional session, one that would demand the best of both students and teachers. To get it, they decided they would have to:

- Get top professional men to talk on each subject
- Limit the number of students in the program
- Get the right students to attend
- Pick the right spot for the meeting
- Establish a natural sequence for introducing each topic
- Inject a strong element of student participation.

Every speaker selected came armed with either a strong management training and consulting background or deep experience in some utility field. Many were authors, university professors, or both. To establish a close rapport between students and teachers, registration was limited to 45 men, with no more than five from any one utility. Utilities were asked to send men whose background would enable them to contribute to, as well as learn, from the program.

The planners wanted an isolated spot where the students would not be distracted by company business or lured by the activity of a city. And they wanted to promote informal discussions between the students and faculty, as well as among the students themselves. The site they came up with was ideal—a private country club about 80 miles from Portsmouth, N. H., and deep in the foothills of the White Mountains. To hold costs to a minimum, ECNE ran the sessions after the club's normal social season. Men were quartered two to a room, pairing up men from different companies who were only slightly acquainted.

To pack the most into the limited time and still elicit maximum participation from the students, the sub-committee decided a three-pronged approach—a

What Is Middle Management . . . ?

Of course, definitions vary from utility to utility, depending on company size, philosophy, pattern of organization, and distribution of responsibility. (ECNE's own definition was from the second level of supervision up to, but not including, officers.) But the department breakdown at ECNE's recent conference provides a pretty good sampling. Although the ECNE planners made no attempt to influence the "student mix," the group turned out to be an excellent cross section of utility structure. Here's how it was distributed:

- **16 from operations and maintenance,** including titles such as supervisor, distribution and transmission; assistant division head, distribution; plant superintendent; assistant superintendent; plant maintenance.
- **7 from engineering and construction.** Three were classed simply as electrical engineer. Others included construction manager and superintendent of electrical construction
- **7 from accounting operations,** including two assistant treasurers;
- **5 from sales,** with titles such as power sales manager and assistant residential sales manager
- **4 district managers**
- **2 from employee relations**
- **1 each from purchasing, legal department, data processing,** and
- **1 vice president**

And What Do They Need to Learn?

ECNE's program was tailored to utility men and centered on essential management skills such as forecasting, planning and organization. Teaching methods included lectures by experts, group discussions, and evening speakers. Here's how the program looked:

Sunday — **Registration,** get acquainted, and general introduction

Monday

8:00-10:45 — **The Management Job**—Sherman R Knapp, president, EEI and Connecticut Light & Power Co
10:45-12:15 — **Project Group Discussion**—Self-introduction, orientation on group discussions and use of case studies
1:30-2:30 — **Forecasting**—H. R. Parker, load & revenue analyst, New England Electric System
2:30-4:00 — **Long Range and Short Range Planning**—J. E. Mueller, director of planning, West Penn Power Co
7:30-9:00 — **The Role of the Utility in the American Economy**—Edwin Vennard, managing director, EEI

Tuesday

8:30-11:15 — **Principles of Organization**—E. Dale, associate professor, Graduate School of Business, Cornell Univ.
11:15-12:15 — **Project Group Discussion**—"The Publix Service Co Case"
1:30-3:00 — **Project Group Discussion**—"The Publix Service Co Case", cont'd
7:30-9:00 — **The Why's and How's of Regulation**—Edward N. Gadsby, chairman, SEC

Wednesday

8:30-11:15 — **Establishing and Maintaining Controls**—A. W. Rathe, associate professor of management engineering, New York Univ.
11:15-12:15 — **The Art of Delegation**—P. V. Hayden, vice president, Connecticut Light & Power Co
7:15-9:00 — **Project Group Discussion**—The Vine Brothers Case

Thursday

8:30-10:00 — **The Selection Process**—J. R. Maher, employment & training manager, Connecticut Light & Power Co
10:15-12:15 — **Fundamentals of Appraisal and Development**—J. L. Hayes, dean, School of Business Administration, Duquesne Univ.
1:30-2:30 — **Fundamentals of Appraisal and Development,** cont'd
2:30-4:00 — **Project Group Discussion**—Using the Tools of Appraisal
7:30-9:00 — **The Utility and the Labor Union**—L. M. Kearns, partner, Morgan, Brown & Kearns

Friday

8:30-10:00 — **Project Group Discussion**—Using the Tools of Appraisal, cont'd
10:15-11:15 — **The Psychology of Persuasion**—M. R. Feinberg, associate professor of psychology, College of the City of New York
11:15-12:00 — **Project Group Discussion**—Using the Tools of Appraisal, cont'd
1:30-2:00 — **An Overall View of Communications**—J. J. Foley, assistant vice president, NEES
2:00-3:30 — **Oral Communications**—D. C. Phillips, head, Department of Speech and Drama, Univ. of Conn.
3:30-4:30 — **How To Listen Effectively**—D. C. Phillips
7:30-9:00 — **The Manager as A Counselor and Coach**—M. R. Feinberg

Saturday

8:30-10:00 — **Project Group Discussions**—Reports by three groups to entire student body
10:15-11:15 — **Industrial Statemanship in a Changing World**—F. F. Bradshaw, chairman of the board, Richardson, Bellows & Henry Co
11:15-11:30 — **Evaluation Questionnaire**
11:30-12:30 — **Concluding Remarks and Presentation of Certificates**—H. L. Chandler, vice president, New England Gas & Electric Assoc. and A. A. Cree, president, Central Vermont PS and president of ECNE.

combination of classical and modern teaching methods—was needed. Here's what it included:

- A series of lectures, largely by outside experts and utility management, on the skills of management and their uses;
- Project group discussions, spaced between the lectures and using case histories of typical management problems. These gave the students a chance to try out the principles learned from the lecturers;
- Rounding out the program, a series of evening speakers on related management problems, generally involving outside organizations such as labor unions, regulatory bodies, and the economy as a whole.

Sherman R. Knapp, president of Connecticut L&P and of the Edison Electric Institute, kicked the program off by outlining the essential management skills. From there, the lecturers and project groups took over. The final program, at the bottom of page 85, shows how the three elements were interwoven.

Of the 48 investor-owned utilities in ECNE, 25 sent men to the conference. Average age of the men was about 45. For project group work, the 45 men were split into three groups of 15 each. At the end of the week, the groups were merged to compare notes on the answers each had worked out for the case histories.

But how did the students themselves like the course? Judging from their response, tremendously. As indicated in schedule on page 85, the sub-committee set aside a 15-minute period on the last day for an evaluation questionnaire. Students were asked what they liked about the course, what they disliked, what they thought of the teaching methods and materials, how they liked the accommodations and what their overall reaction to the course was.

"The outstanding calibre of the speakers" and the excellent organization of the program made the biggest impression on the students. In each case, at least 30 of the 45 participants specifically mentioned these aspects as outstanding. The group projects and the setting chosen for the meeting also drew plaudits, but it was the "number of experts on the speakers list"—"the professionalism which permeated the whole program"—the high calorie content of the program and the speed with which it moved along that made the biggest hits.

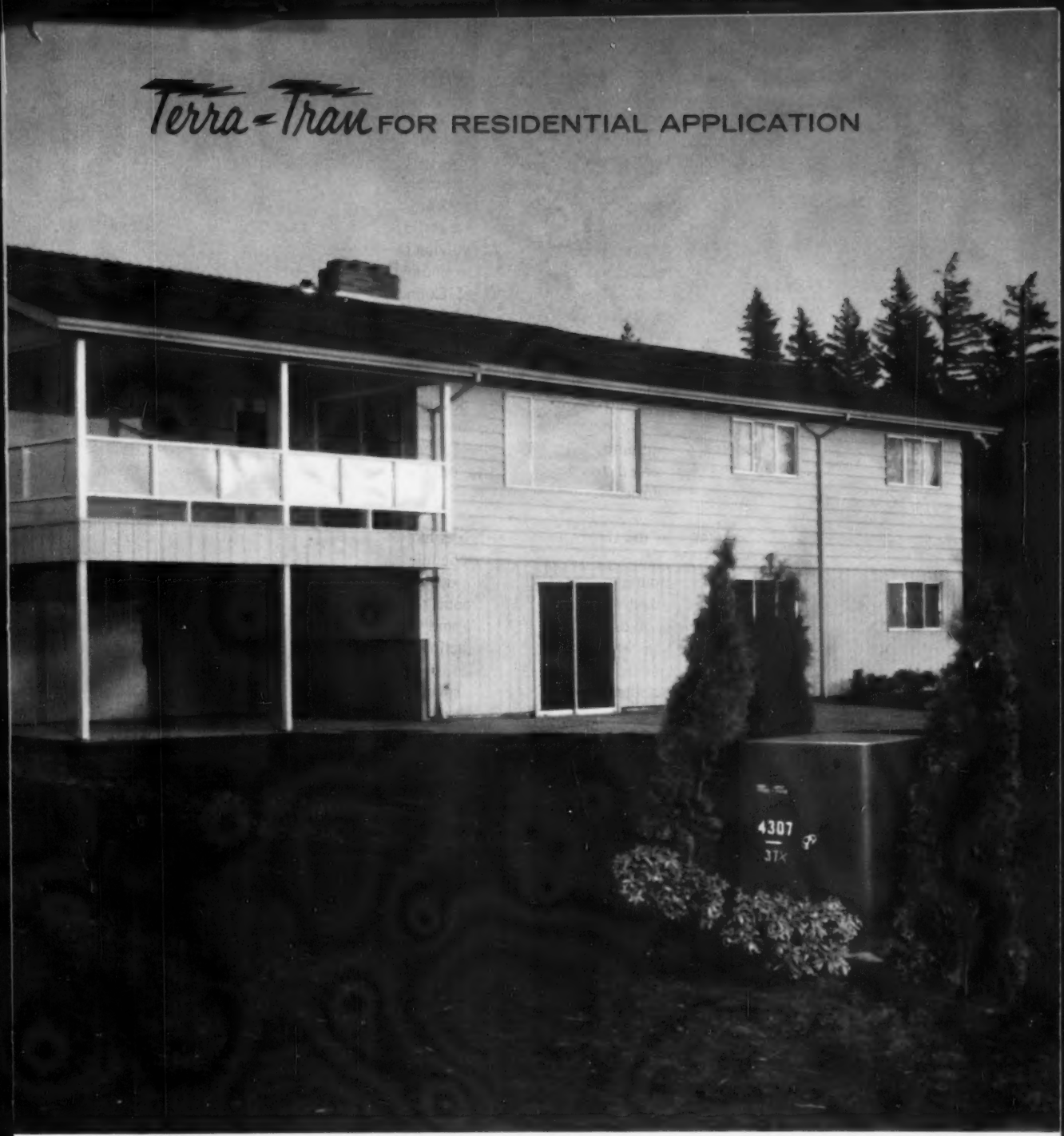
Almost two-thirds of the men could find nothing to dislike in the course. What criticism there was—and even this was mild—centered on the large amount of material presented in such a relatively short time and the inevitable problems of assimilation. Most critics wanted more time for informal talk and thinking. And in the accommodations, 38 of the 45 men had absolutely no complaint. A few men—six in all—felt that one or two of the subjects were too technical or not in their field.

Perhaps the most significant response was in general reactions to the course. The dominant and repetitive theme here was the stimulus for personal reappraisal that the program had provided. Repeatedly, students praised the program's efficacy in encouraging them to re-examine themselves, put themselves in perspective with their own organization, and re-appraise their own potentials.

What changes would the planners make in a new session? Very few. Perhaps a few shifts in speakers, to schedule the toughest subjects when the men are freshest. And possibly a little more free time to give the men more time to assimilate the huge amount of material. But generally, they felt that overdriving the men a little was preferable to underdriving them.

As for the future, the ECNE planners considers the conference as only the opening gun—a prototype—of a whole series of management training programs. The need for top utility managers is becoming more acute. And ECNE believes it has found a good formula for producing them.

Terra-Tran FOR RESIDENTIAL APPLICATION



Terra-Tran underground distribution is ideal for residential service. Terra-Tran is the only visible portion of the underground distribution system. There are no poles or guy wires to mar residential landscaping; play areas are free and clear from distractions and hazards. Easily concealed by shrubs and bushes, Terra-Tran actually becomes part of the landscape.

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Terra-Tran — pioneered and developed by RT&E — is available in a wide range of single phase ratings, from 15 KVA to 167 KVA.

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D60-1

Air Conditioned Schools Won't Up Cost Much

Building costs will increase not more than 10%, but attention must be paid to school design, experts say

The latest battle in educational circles is whether or not to keep schools open the year 'round. Utilities are watching this with a careful eye because of the prospects for increased air conditioning load.

Recent statements by authorities indicate additional air conditioning won't cost school boards very much either.

Henry Wright, associate professor of architecture at Columbia University, said that school buildings can be built with air conditioning at no extra cost. Don Petrone, president of Typhoon Air Conditioning Division, Hupp Corp, disagrees only slightly. He said school building costs will increase only 10%, with a 25% increase in usefulness.

Also, a new concept in school buildings is being planned for Beaumont, Texas, with year-round air conditioning playing a major role.

Wright described an experiment in Pinellas County, Florida. He said an architect and an engineer undertook to design an eight-room school with air conditioning that could be built for the same amount as a same-sized school without air conditioning.

The result: The air conditioned school cost approximately $80,000 to build; the other school, $96,000.

Wright said that a specific type of building, he called it the "compact school," must be constructed if the air conditioned building cost is to stay in line with cost of buildings without air conditioning.

He also said that the compact school in Florida had less total floor space than the conventional building, but the amount of classroom space was about the same in each.

Petrone estimated that schools now cost communities $20 per sq ft to build and are used for only nine months. If another $2 per sq ft was spent for air conditioning, communities could use the buildings the whole year and would be able to handle a school population 25% larger.

If a store or office building had to operate only nine months a year the cost of doing business would be virtually prohibitive, Petrone claimed.

Yet air conditioning a school would be no more difficult than it is for many stores, shopping centers, and low, modern office buildings, he said.

The school in Beaumont will have a simple rectangular shape which exposes a minimum of the building's outside surface to the elements. It is expected to make air conditioning so economical that it will pay for itself by reducing school operating costs.

National Electrical Week Theme Set

"Make Electricity Work For You" will be the theme of 1961's National Electrical Week next Feb. 5-11.

The theme was selected as one which could be adapted to all segments of the electrical industry, and to which each participant could add his own interpretation and own particular message.

The 1961 National Electrical Week Planning Guide is being distributed to more than 6,000 industry groups and executives across the country. The guide contains sample programs of activities staged by 16 different communities during the last observance, a calendar check list to enable participants to keep a month-to-month schedule for the next observance, and information on special materials available.

Additional copies of the planning guide may be ordered from National Electrical Week Headquarters, Suite 306, 407 North 8th St, St. Louis 1, Mo. Price: $1 each.

All-Electric School Booklet Published

Jersey Central Power & Light Co/New Jersey Power & Light Co has published a report on the all-electric schools in its area.

The 16-page booklet gives the benefits of electric heating, good lighting, electric water heating, and cooking in schools. Pictures and statistics of the area's all-electric schools are shown.

Further information can be secured from Commercial Sales Department, JCP&L/NJP&L, Madison Ave at Punch Bowl Rd, Morristown, N. J.

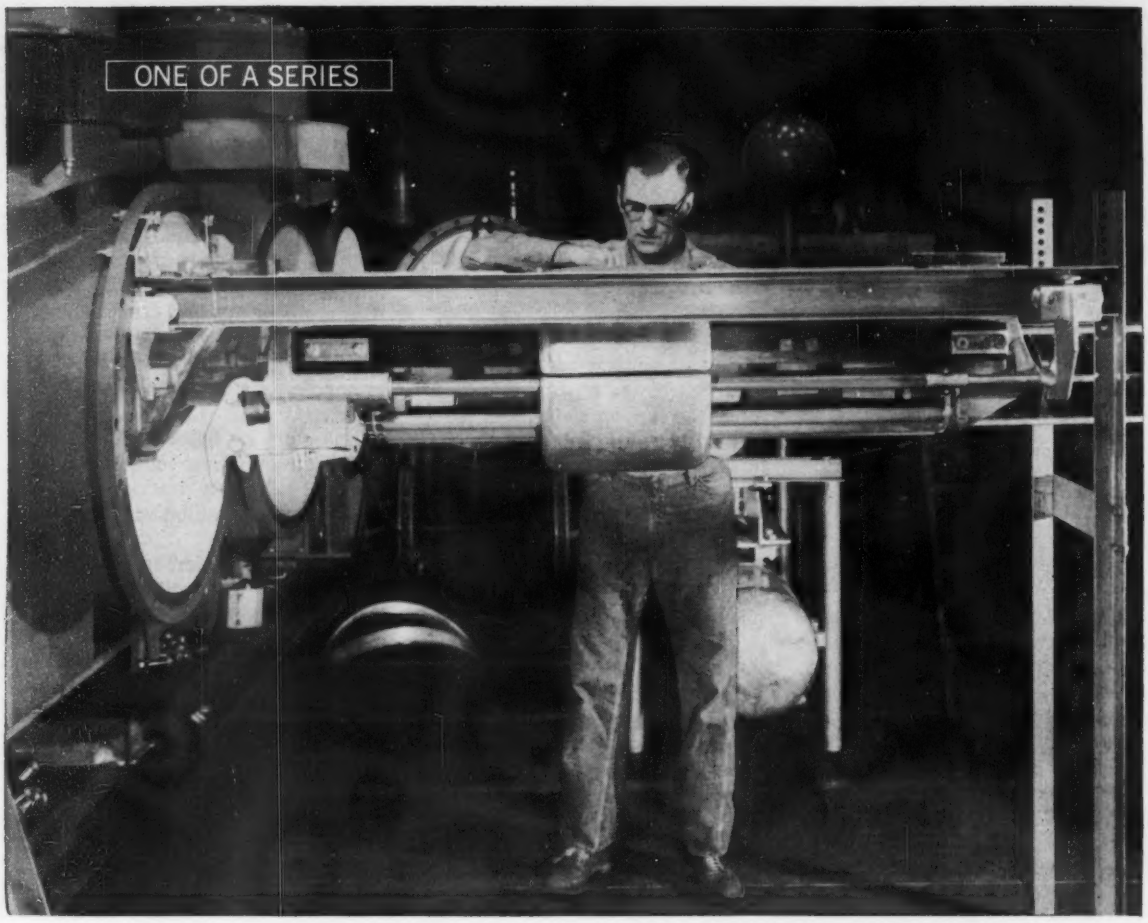
Investment Center Displays GE Consumer Products

A consumer products exhibit to show the public "Tomorrow's Living Today in a Medallion Home" has been opened in New York's Grand Central Station by General Electric Co.

The exhibit, located in the Merrill Lynch, Pierce, Fenner and Smith Investment Information Center, features a built-in kitchen-laundry, electroluminescent panels, details of room-by-room electric heating and air conditioning, and a remote control wiring system.

New York area Medallion Home builders are featured in one section.

The information center was opened in 1956 to increase public understanding of the stock market and to interest more Americans in becoming share owners in industry. The GE exhibit will be open during November and December.



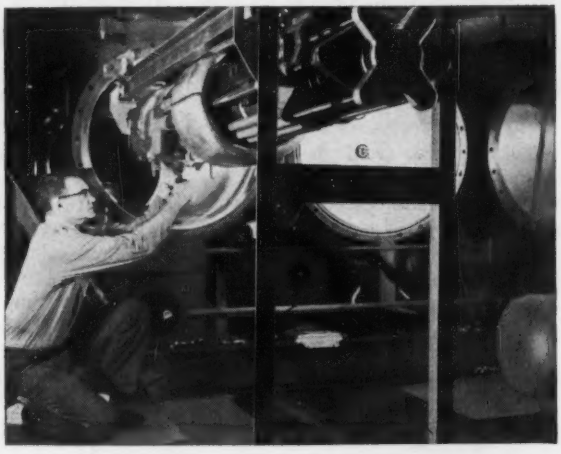
New, Easy, Ground-level Inspection of SF_6 Gas Breaker Slashes Maintenance Costs

provides greatly improved performance from 69 to 460 kv and beyond

A unique horizontal interrupter design in the new Westinghouse gas power circuit breaker now brings the interrupters within easy reach of the maintenance man. No scaffolds, block and tackle or ladders are required to inspect breaker contacts. Now workmen can perform all maintenance comfortably . . . from the ground!

The interrupter can be removed from each tank of the Westinghouse breaker in just 15 minutes.

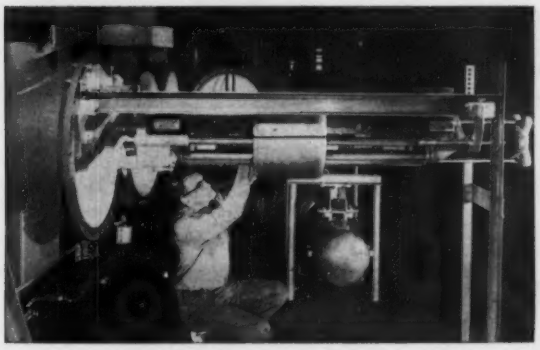
After evacuation of the SF_6, a set of lightweight aluminum rails is installed inside the pole unit. Trolleys are attached to the interrupter; bolts are removed at the bushings, operating rod and high-pressure tube. The interrupter can then be pulled out for inspection. There is no heavy equipment to be lifted! There is no easier way to remove an interrupter.



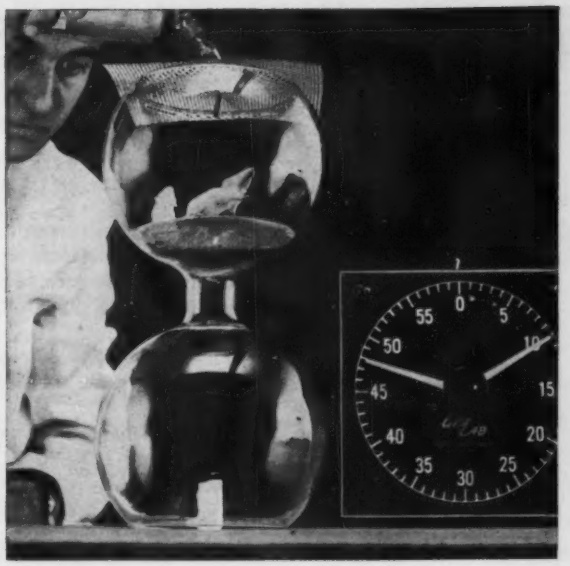
Operation of the interrupter is easily checked by attaching a jack and opening and closing the contacts by hand. This convenient operation-check is another cost-saving advantage over other breaker designs.

The advanced interrupting techniques developed in this new gas breaker, improved contact design and efficiency of the SF_6 (sulfur-hexafluoride) interrupting medium combine to *reduce the need* for periodic maintenance to a fraction of present accepted practice. *Over-all* maintenance costs of the Westinghouse gas breaker are estimated to be less than half those of other breakers.

Extensive field and laboratory experience (since 1953) has proved that SF_6 is completely safe to use



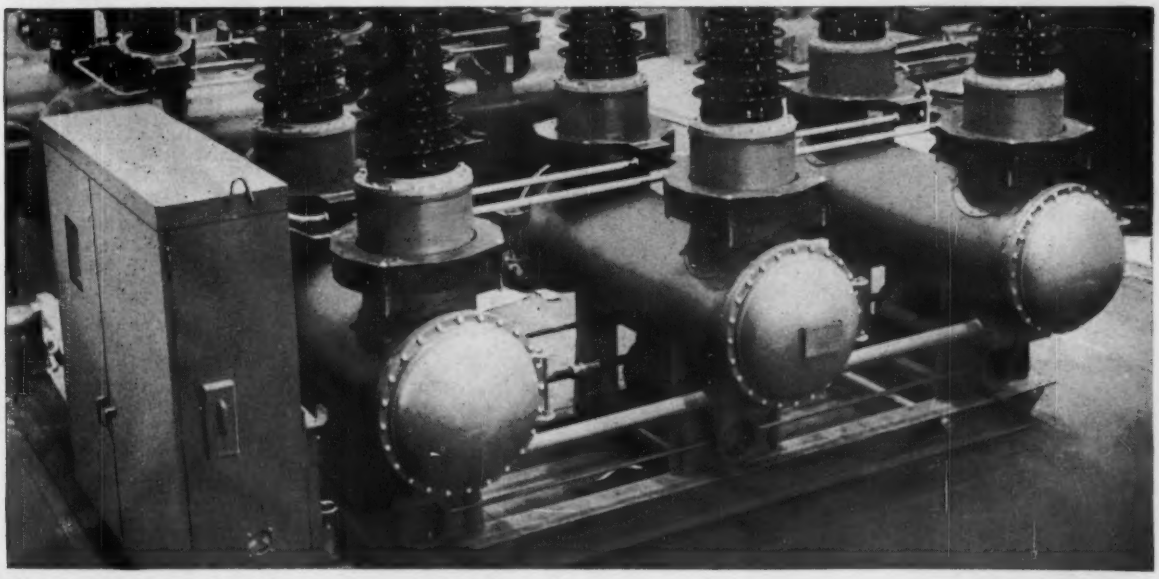
without any harmful effect on personnel. Only precautionary measures of the common-sense variety are recommended. The gas is carefully filtered by activated alumina, as it is circulated in the breaker high- and low-pressure systems, to remove any gaseous arc products. Any solid arc products left in the pole unit after evacuation can be quickly blown out



with compressed air.

This inert, nonflammable, nontoxic gas is heavier than air as demonstrated in the laboratory experiment above. The SF_6 sinks to the bottom, snuffing out the candle. Tests show that the mice can live in a mixture of 80% SF_6 and 20% oxygen for 24 hours without ill effect.

To learn more about the way the Westinghouse gas breaker can cut installation and maintenance costs and increase breaker performance, call your Westinghouse sales engineer. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. You can be sure . . . if it's Westinghouse. J-61006



Westinghouse Gas Breakers for Improved Performance from 69 to 460 Kv and Beyond

Westinghouse

Southern Services VP, Comptroller Named

J. M. Reynolds has been named vice president, comptroller and a director of Southern Services, Inc, succeeding R. H. Freese who retired.

Reynolds will supervise all accounting, depreciation, evaluation, statistical, auditing, payroll, tax, and insurance activities.

W. B. Horsburgh was elected to replace Reynolds as treasurer and assistant comptroller, while D. G. Wurreschke became assistant comptroller and tax advisor.

C. R. Murton has been promoted to manager of rate and marketing services, succeeding the late J. A. Zobel, and J. R. Jones became assistant manager of rate and marketing services.

J. M. REYNOLDS ▶

J. R. Kearney Corp Appoints Deal General Sales Manager

Robert E. Deal has been appointed general sales manager for the James R. Kearney Corp. He will be responsible for coordinating sales of the 3E Co line of switchgear and apparatus and the Kearney line of electric utility equipment.

Deal was formerly manager of marketing for the 3E Co which has recently been acquired by Kearney. He is an electrical engineering graduate of the University of Tennessee. Deal has had five years' experience with Line Material Industries, a McGraw-Edison Co division, and six years' with Duke Power Co.

◀ ROBERT E. DEAL

Arnett Heads Sales For GE Department

ARNETT

Howard Arnett, vice president of Portland General Electric Co, has been named manager - domestic power reactor sales for General Electric Co's atomic power equipment department.

A bachelor of science graduate of the University of Idaho, Arnett joined Portland GE in 1936 and held several posts with the utility before entering the US Navy in 1942.

He returned to Portland GE in 1945 as an engineer and was successively promoted to purchasing agent, assistant general superintendent, assistant to the chairman of the board, and vice president.

Kerr New President Of Fluor Products

KERR

Robert W. Kerr has been elected president of Fluor Products Co, a division of The Fluor Corp, Ltd. He was also made vice president and a member of the corporation's board of directors.

Kerr came to Fluor Products from Fairbanks, Morse & Co, where he was president and director. Before that he had been vice president of Fairbanks Whitney Corp, parent company of Fairbanks, Morse.

A graduate of the University of California, Kerr has held executive positions with Plomb Tool Co, the Herbrand division of Bingham-Herbrand Corp, and American Machine & Foundry Co.

(*More News About People on page* 94)

D. I. S. STRIPS 10-INCH SCALE FROM 12-INCH PIPELINE IN JUST ONE DAY!

Dense scale deposits of oxides, sulfides and sulphur—10 inches thick in some places—clogged a 12-inch fuel supply line. Dow Industrial Service engineers stripped every trace of deposits from this 750-foot pipeline—restoring full capacity—in *just 24 hours!*

Solvents and a pipeline pig did the job. But for different conditions, D. I. S. uses other techniques to get the same result. For example, when scale blocked a 24-inch, quarter-mile-long waste line, D. I. S. engineers knocked out the deposits with a special D. I. S.-designed jet mole. Though this underground pipeline was buried 10 feet deep, D. I. S. cleaned it completely in only 16 hours!

Nation-wide Dow Industrial Service first analyzes the job to be done, then selects the technique which will do the best job, fastest. D.I.S. cleans all kinds of lines—fresh water, boiler feed-water, gas, waste and other lines—and every kind of process and heat exchange equipment.

In addition, D. I. S. offers complete consulting laboratory service for water treatment and waste processing problems, backed by the technical resources of The Dow Chemical Company. For cleaning *any kind* of equipment, *anywhere* in the U. S., write or call DOW INDUSTRIAL SERVICE, 20575 Center Ridge Road, Cleveland 16, Ohio.

DOW

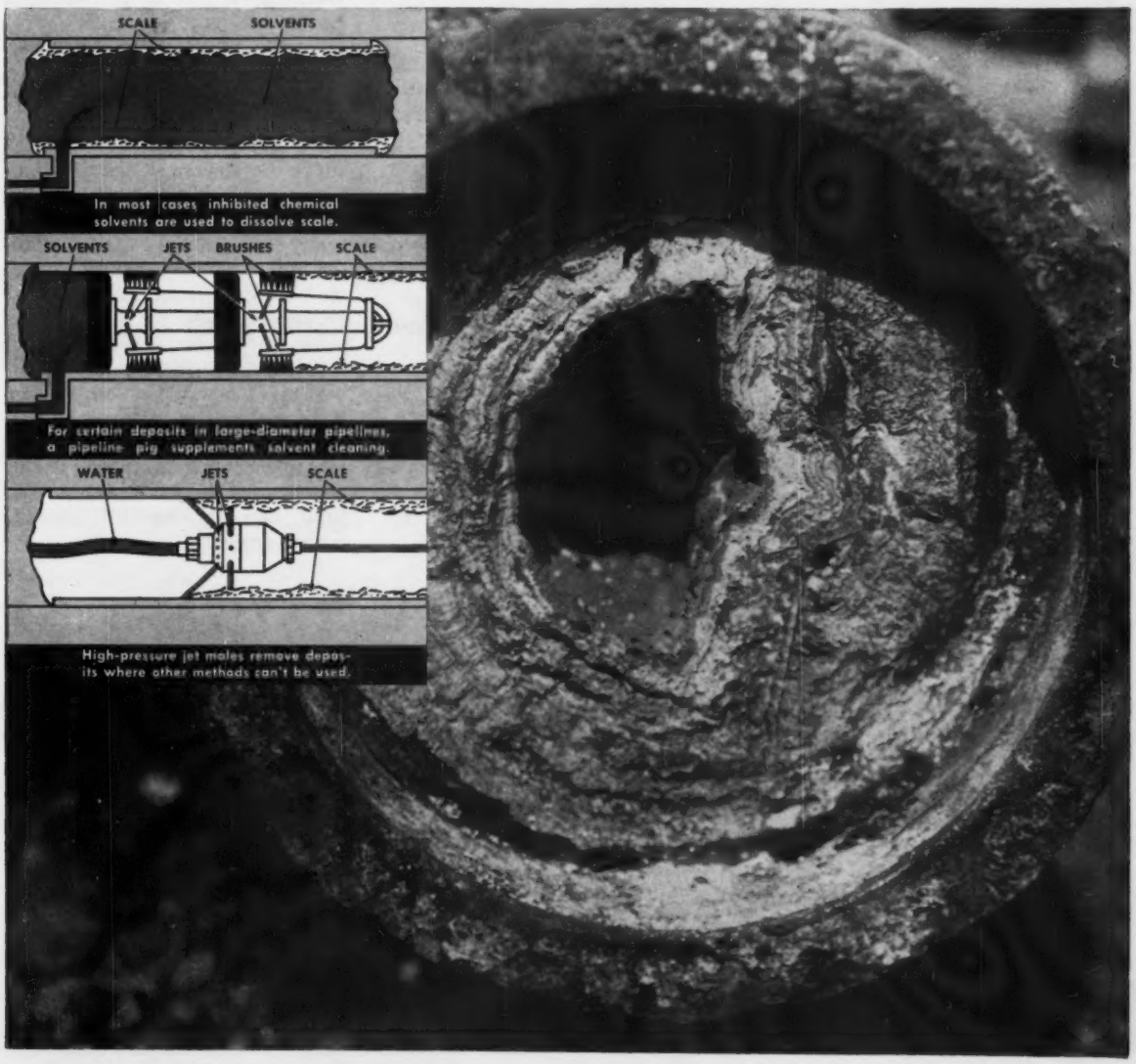
DOW INDUSTRIAL SERVICE • Division of The Dow Chemical Company

From these three methods, D. I. S. selects the one best suited to your specific pipe-cleaning problem.

In most cases inhibited chemical solvents are used to dissolve scale.

For certain deposits in large-diameter pipelines, a pipeline pig supplements solvent cleaning.

High-pressure jet moles remove deposits where other methods can't be used.



will you love that
photocontrol
in December (1963)
the way you did
in June (1961)?

Getting stung with 30,000 "inexpensive" photocontrols that all start failing off three years after installation is no joke, as you can imagine. What kind of *people* make and sell the controls you plan to buy — and are you getting the straight story from them? The Fisher-Pierce Co., 82 Pearl St., So. Braintree 85, Mass.

FP
FISHER PIERCE
Electrical and Electronic Equipment
for Industry, Utilities and the Home
AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

ZAMBOTTI

Three Are Given EW Editorial Positions

Bruno M. Zambotti has joined *Electrical World* as an Associate Editor. Assigned to the New York office, he will bring his more than 12 years' experience with utilities, manufacturers, and consultants to bear on technical articles. Zambotti has worked for General Electric Co, Ebasco International, and Cleveland Electric Illuminating Co.

Michael G. McGraw, who recently joined EW as Methods Editor, has assumed responsibility for the New Equipment section. In the engineering field for the past 15 years, he was an Associate Editor in the McGraw-Hill Book Co.

In EW's news operation, William P. Kennedy has become an Assistant Editor. He will write the Management Newsletter and handle news stories. Kennedy came to EW from the McGraw-Hill editorial trainee program.

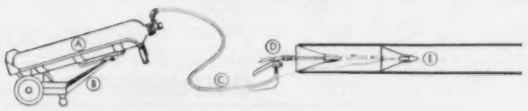
McGRAW

(*More News About People, p* 96)

NEW JET LINE Underground

Cutaway drawing of Jet Line Line Cone line carrier for underground unit. One size works in 1¼" – 4" conduit; just cut cone for snug fit in pipe. Nylon line package is inserted firmly in the Line Cone, which is then forced through the conduit by the expansion of CO2 gas.

Uses Low-Cost, readily available Portable Power



HOW IT WORKS

The source of power for the Jet Line Underground is CO2 – available everywhere in low cost, 50# containers.

Illustration shows its operation.

"A" – 50# CO2 cylinder is easily portable anywhere on the job.

"B" – Jet Line Carrying Cart # CAR-1 is also used with the Refill Unit.

"C" – High pressure flexible hose is attached to the 50# CO2 tank and to the pipe seal-off unit.

"D" – Pipe seal-off unit fits any size pipe from 1¼" through 4".

"E" – Line carrying cone (line cone) is inserted in pipe. Hold on to loose end of line.

Simply by activating the seal-off valve, which holds the pipe seal-off in place, you force the line cone through the pipe.

Two length packages are designed to be inserted in the line cone – #2206 up to 400'; #2207 up to 800'

The pressure of CO2 gas, which expands at a 450 to 1 ratio, forces the line cone through the pipe, clearing mud, water, loose obstructions and laying a strong nylon line as it goes. Use the Nylon line to pull Jet Line Poly Rope, then wire through the conduit. The job is done in minutes instead of hours!

JET LINE UNDERGROUND consists of:

Portable Power Cart (tank not included); High-pressure flexible hose; Pipe seal-off unit and activating mechanism; Jet Line Line Cone line Carriers; Nylon Line packages.

Clears Mud . . . Water . . . Loose Obstructions as it Lays a Line Through 1¼" – 4" Conduit *IN SECONDS!*

Newest addition to the Jet Line Method, the Jet Line Underground provides a fast, safe, sure way to get a pull line through underground conduit. It's also valuable for regular large I.D. conduit in long runs or where mud and water are known to be in the pipe.

Job tests prove that one man, using the Jet Line Underground, can do in a few minutes what would take *two* men 1 to 4 hours (or longer) to do using present methods. In a job test on a 1500' run of 3-1/2" fibre duct, one man put a line end to end – through mud and water – in less than 10 minutes including set-up time!

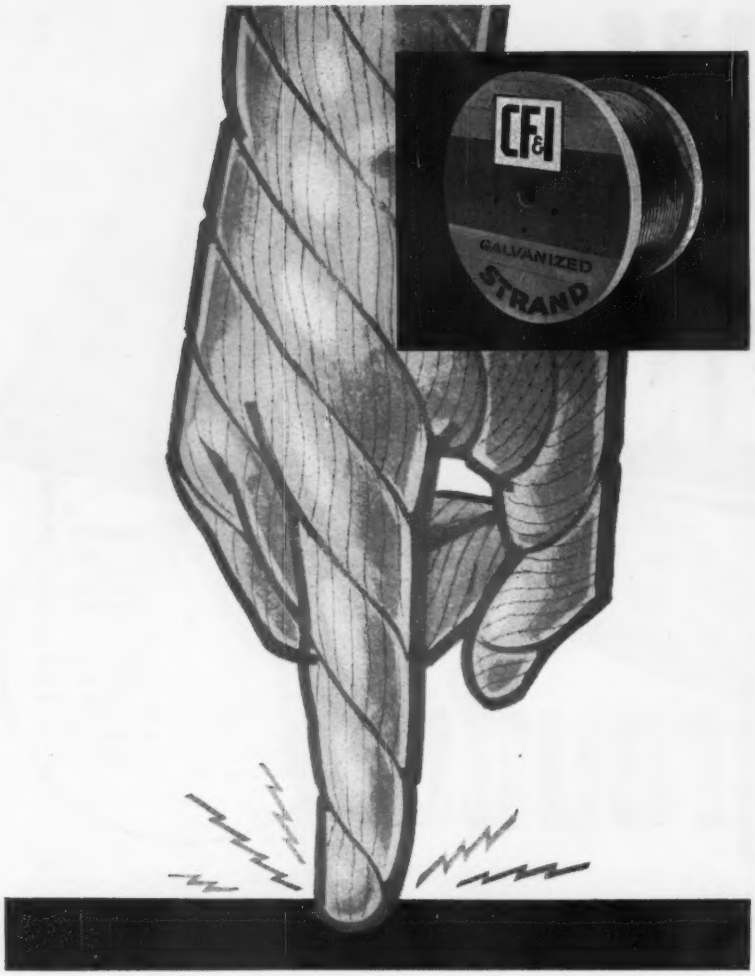
{Caution: read instructions carefully for proper use in non-ventilated areas.}

5070

Ask your distributor or write

JET LINE PRODUCTS, INC.

615 FUGATE AVE., CHARLOTTE 5, NORTH CAROLINA



Ground
the destructive force
of lightning with

CF&I Galvanized Steel Strand

For grounding of power transmission lines, CF&I Galvanized Steel Strand has been proved by years of experience. Weldless Overhead Ground Wire Strand is made of special analysis steel to ASTM specification A-363, in three- and seven-wire constructions. It is carefully galvanized for extra weather resistance.

For guy, messenger and other applications, CF&I Strand is made to ASTM specification A-122. CF&I can also manufacture strand to your individual specifications. For prompt delivery, see your local electrical distributor or contact the nearest CF&I office.

7635-A

CF&I STEEL

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION — Albuquerque • Amarillo Billings • Boise • Butte • Denver • El Paso • Farmington (N. M.) • Ft. Worth • Houston Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland Pueblo • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita
In the East: WICKWIRE SPENCER STEEL DIVISION — Atlanta • Boston • Buffalo • Chicago Detroit • New Orleans • New York • Philadelphia • CF&I OFFICE IN CANADA: Montreal
CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

PERSONAL BRIEFS

Changes in the personnel of the customer accounts division of Philadelphia Electric Co are: **Joseph F. McCahon** to succeed **John J. Natale,** retired, as manager; and **E. Howel Evans** to succeed McCahon as assistant manager.

The following staff changes have occurred at Arkansas Power & Light Co: **J. D. Doyle** became controller and **W. Allen Mebane** manager of accounting, both in the treasury and accounting department; **Aubrey H. Wright** was promoted to administrative assistant in the personnel department; Wright was succeeded by **H. L. Leftwich** as assistant to the central division manager; and **Herbert L. Watters** became local office assistant in the Batesville, Ark., office.

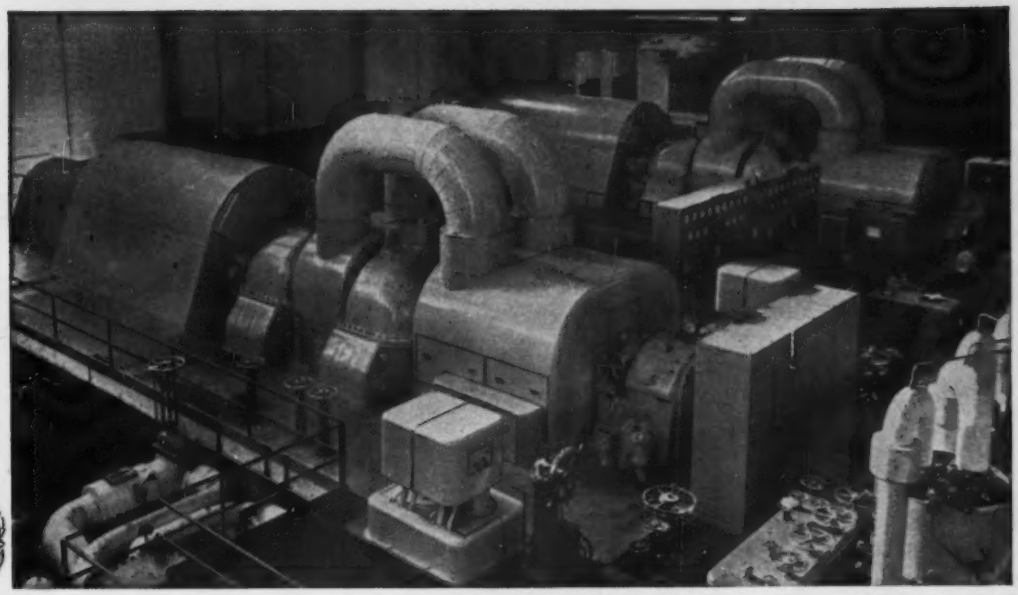
Allen D. Helveston Jr has become buyer in the purchasing department of Keasbey & Mattison Co.

John F. Rushmore has been named by Continental-Diamond Fibre Corp as manager of sales administration.

Kenneth V. Farmer, vice president of Canadian Ohio Brass Co, Ltd, and member of the board of directors of Ohio Brass Co, has retired.

OBITUARIES

Otto C. Henke, 67, president and founder of C&H Electric Machine Co . . . **Paul P. Huffard,** 72, former director and vice president, Union Carbide Corp . . . **W. W. Waymack,** 72, former member of the Atomic Energy Commission . . . **John Franklin Rodman,** 59, supervisor at Potomac Edison Co . . . **Theodore L. Kizer,** 72, former superintendent of Duke Power Co's Rhodhiss hydroelectric plant . . . **Dr W. R. G. Baker,** 68, retired vice president of General Electric Co . . . **Robert S. Daunoy,** 76, secretary-treasurer of the Houston Lighting & Power Co . . . **Edward J. Hubbert,** 81, retired supervisor in the aerial lines department of Philadelphia Electric Co . . . **Arthur O. Olsen,** 70, retired director of finance for Seattle City Light Co.



IN CANADA *Two 'ENGLISH ELECTRIC' 45,000 kW MCR hydrogen cooled 60-cycle turbo-alternator sets of the Nova Scotia Light and Power Co. Ltd., Halifax.*

it started in grandpa's days..

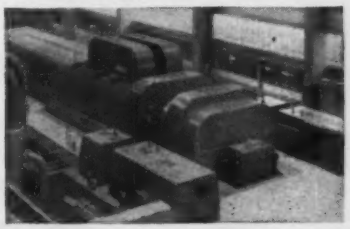
Even in the early 1900's, when electricity had yet to establish itself for lighting our grandparents' homes and streets, 'ENGLISH ELECTRIC' was already experienced in the manufacture of steam turbines and alternators.

Since then, 'ENGLISH ELECTRIC' has been supplying steam turbo-alternator sets to industry and public utilities throughout the world.

FROM 400 kW to 375,000 kW and UPWARDS

A comprehensive range of units from 400 kW is available with a wide variety of applications for the economic and reliable production of power and process steam for industrial plants. To enable large electric utilities to meet today's growing demand for more and cheaper power, 'ENGLISH ELECTRIC' offers cross-compound units on two shafts or the more advanced tandem compound machines on one shaft. Both types are available for operation under conditions employed in the most advanced engineering practice.

The world-wide organisation of 'ENGLISH ELECTRIC' with factories in five continents is near at hand to any undertaking needing power engineering. This group of Companies can provide anything from a small individual drive to a comprehensive scheme with generating plant using steam, water, gas, oil or atomic power.



IN GREAT BRITAIN
One of five 'ENGLISH ELECTRIC' 200 MW turbo-alternator sets in the turbine room of the High Marnham Power Station of the Central Electricity Generating Board.

IN MALAYA
Two 'ENGLISH ELECTRIC' 10,000 kW, 3,000 r.p.m. turbo-alternator sets in Malacca Power Station, of the Malayan Central Electricity Board.

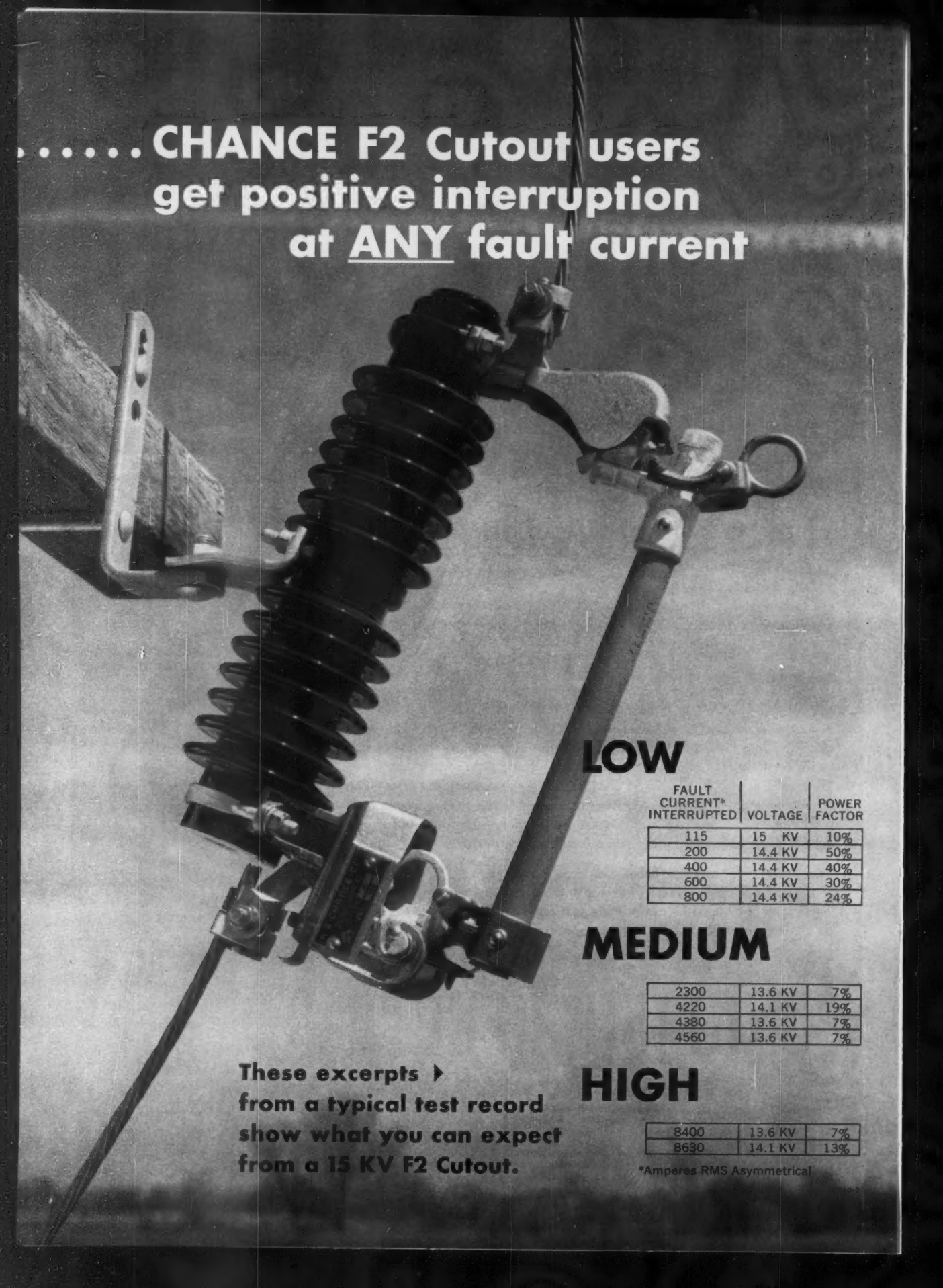
'ENGLISH ELECTRIC'

Agents: ENGLISH ELECTRIC EXPORT & TRADING CO. LTD., 750 THIRD AVENUE, NEW YORK 17, N.Y. Telephone: MURRAY HILL 7-0303

Sub-Agents:—

James I. Metcalf & Co. Inc., Room 704, 1411 Fourth Avenue, Seattle 1, Washington. Branch office in Portland, for Washington and Oregon.
Electron Equipment Co. Inc., 2418 Calhoun Street, New Orleans, 18, Louisiana, for Louisiana and Mississippi.
Osgood & Associates, Inc., 988 Spring Street, N.W., P.O. Box 7383, Station C, Atlanta, Georgia, for Georgia, Alabama, Tennessee and South Carolina.
Peabody Brothers, 2903 St. Louis Street, at Oakland, Dallas 26, Texas. Branch office in Houston, for Texas, Oklahoma, Arkansas and New Mexico.
Flagg, Brackett & Durgin, Inc., 183 Essex Street, Boston 11, Massachusetts, for Massachusetts, Rhode Island, Maine, New Hampshire and Vermont.
Charles R. Lee & Associates, Inc., 3796 West Flagler Street, Miami 44, Florida, for Southern Florida.

OC/US/9


.....CHANCE F2 Cutout users
get positive interruption
at ANY fault current
LOW
FAULT CURRENT* INTERRUPTED
VOLTAGE
POWER FACTOR
115 15 KV 10%
200 14.4 KV 50%
400 14.4 KV 40%
600 14.4 KV 30%
800 14.4 KV 24%
MEDIUM
2300 13.6 KV 7%
4220 14.1 KV 19%
4380 13.6 KV 7%
4560 13.6 KV 7%
HIGH
8400 13.6 KV 7%
8630 14.1 KV 13%
These excerpts ▸
from a typical test record
show what you can expect
from a 15 KV F2 Cutout.
*Amperes RMS Asymmetrical

the object being to determine whether or not it would be economical to build a meter that is hermetically sealed. A more reliable and less expensive meter should result." One utility already has experience with meters sealed against water.

"At least seven commissions have changed their regulations so that utilities may test their meters on a sampling basis. Practically all these regulations make use of the United States military standard No. 414 to determine lot size, sample size and allowable quality level; yet the present regulations in force are rather varied."

Water Requirements Policy

L. W. CADWALLADER, Vice President and Mechanical Engineer, Potomac Electric Power Co.

"The record of the public hearings and the reports of the Select Committee on National Water Resources, chaired by Senator Kerr of Oklahoma, provide an unprecedented assembly of facts and opinions on the whole broad subject of water resources activities, water requirements and water problems in the United States.

"The Edison Electric Institute, in response to a request from Sen Kerr, prepared and submitted to the Select Committee a carefully prepared report on the future of the electric power industry in relation to water resources." The Select Committee also received a report on "The Future of Hydropower Through 1975" from Resources for the Future, Inc, a non-profit Washington, D. C., organization.

EEI's report indicated that the investor-owned utilities circulated approximately 23,500 billion gallons of river, lake and sea water through their steam-plant condensers in 1959 and predicted that this will become 86,000 billion gal in 1980. Water circulated through cooling towers will increase from 2,750 billion to 15,500 billion gal in the same years. Artificial cooling reservoirs and ponds will increase by about 800%.

"This all adds up to a tremendous amount of heat which must be dissipated in the production of electricity. Heat pollution of the waters of this country is rapidly becoming a major consideration in the granting of water use permits to electric utilities and to industry. Some states already have regulations limiting heat pollution of their rivers and streams, and federal interest is active.

"Another significant development this year is the National Conference on Water Pollution to be held in Washington, D. C., on Dec. 12-14 and called by the US Department of Health, Education and Welfare at the direction of President Eisenhower. The results of the conference may well have an influence on subsequent Congressional legislation."

Manufacturers' representatives discussed developments that will aid utilities in meeting their future needs.

Allis-Chalmers Mfg Co

LEONARD LINDE, Director of Electrical Engineering, Allis-Chalmers Mfg Co.

In thermonuclear development at the Stellarator project at Princeton, "there remains a big IF: if our scientists can heat this gas to 100 million degrees and if it can then be continuously confined in a magnetic field. A practical fusion reactor power plant, using the Stellarator principle, would have a minimum economic capacity of 5,000 Mw. The C-Stellarator Facility of Princeton University, designed and fabricated by Allis-Chalmers and Radio Corp of America, will be in operation early in 1961.

"Allis-Chalmers has completed the development and construction of an experimental 40-kw magneto-hydrodynamic generating unit, using oxygen and kerosene for combustion." A 300-Mw plant is being studied to employ this concept as the topping component.

On the less exotic side, "our transformer department quotes:

(*Continued on page 102*)

You can buy Chance F2 Cutouts with confidence, sure that you're getting these advanced features so important for the protection you need:

- EXPENDABLE CAP assures wide-range operation on *any* fault. A small disc in the cap is ripped off on high fault currents, permitting the double-venting required to hold shock and strain to a minimum. On low and medium faults, the disc stays in place. By keeping the gases under the cap, the F2 single-vents to give protection against these lower faults.
- FUSE LINK EJECTOR makes doubly sure the cutout operates on low fault currents. Teamed with a small-bore fusetube, it assures low fault current interruption. Vitally important to load-break operation.
- POSITIVE LATCH holds fuseholder with a "bulldog grip"... keeps the cutout from opening under vibration or impact. Even if the fuselink is not installed tightly (or slips or stretches after installation), the fuseholder will not drop out. The latch cannot be welded shut because it is not a primary current-carrying element.
- ALL-BRONZE SLEET HOODS at both ends completely protect vital contact areas under all weather conditions. These all-bronze sleet hoods, and extensive use of copper alloy in the F2, guarantee trouble-free, peak performance, even in the most contaminated atmosphere.

  The F2, in voltages of 5.2, 7.8, 15 and 27 KV, and in 100 and 200 ampere ratings with interrupting capacities as high as 12,000 amps, are available from local stocks.

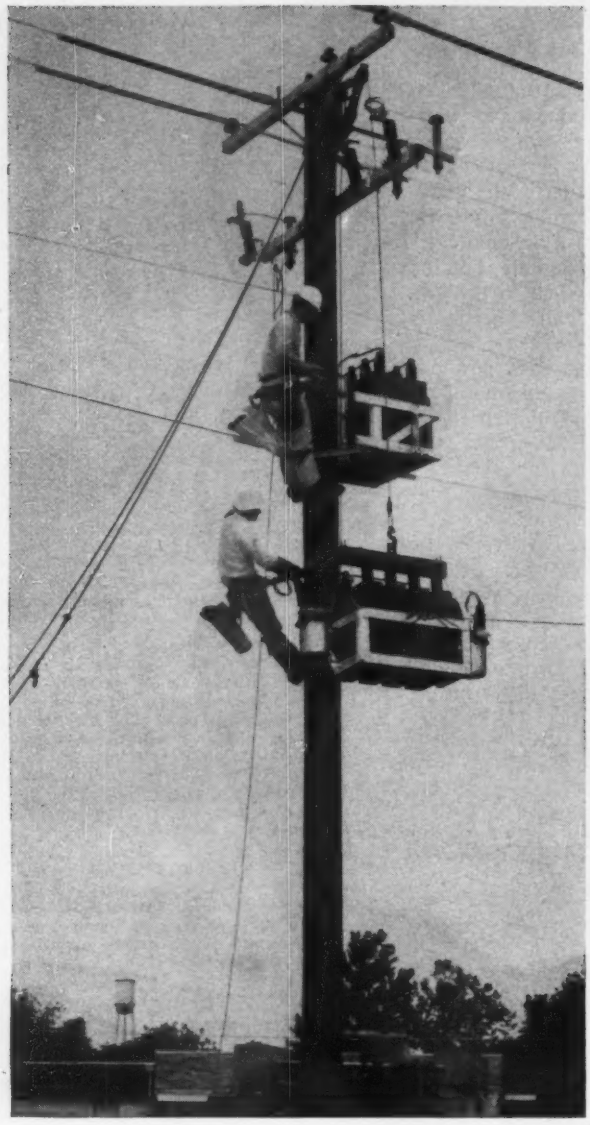
Chance F2 Cutouts are also available in combination with lightning arresters

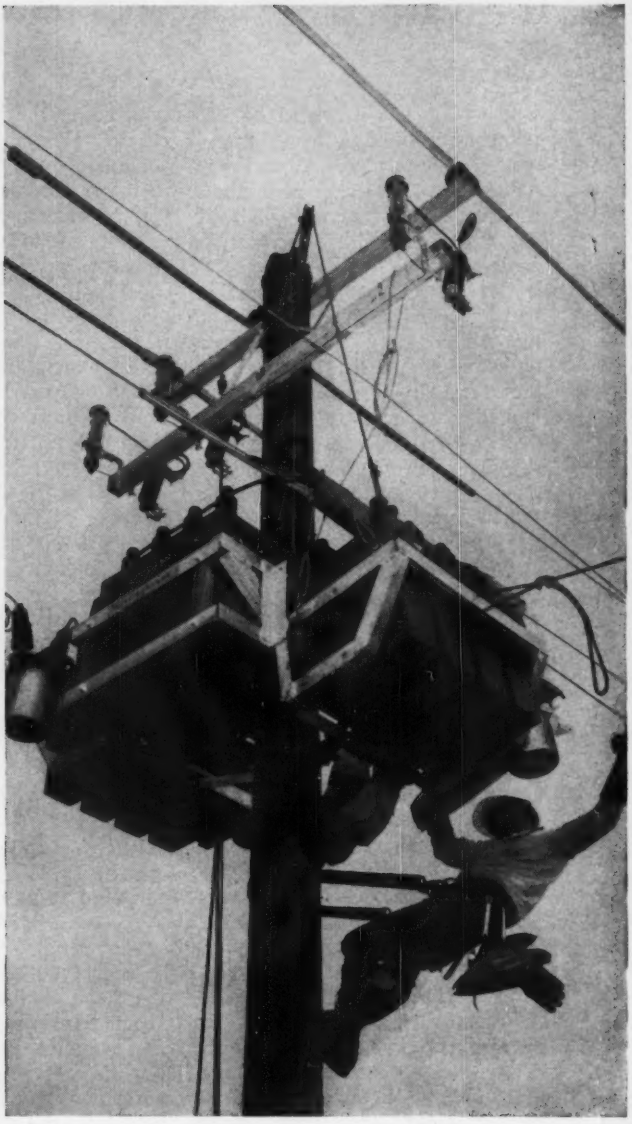
CK60-36

A. B. CHANCE CO.

CENTRALIA, MISSOURI

(A. B. Chance Company of Canada, Ltd., Toronto)



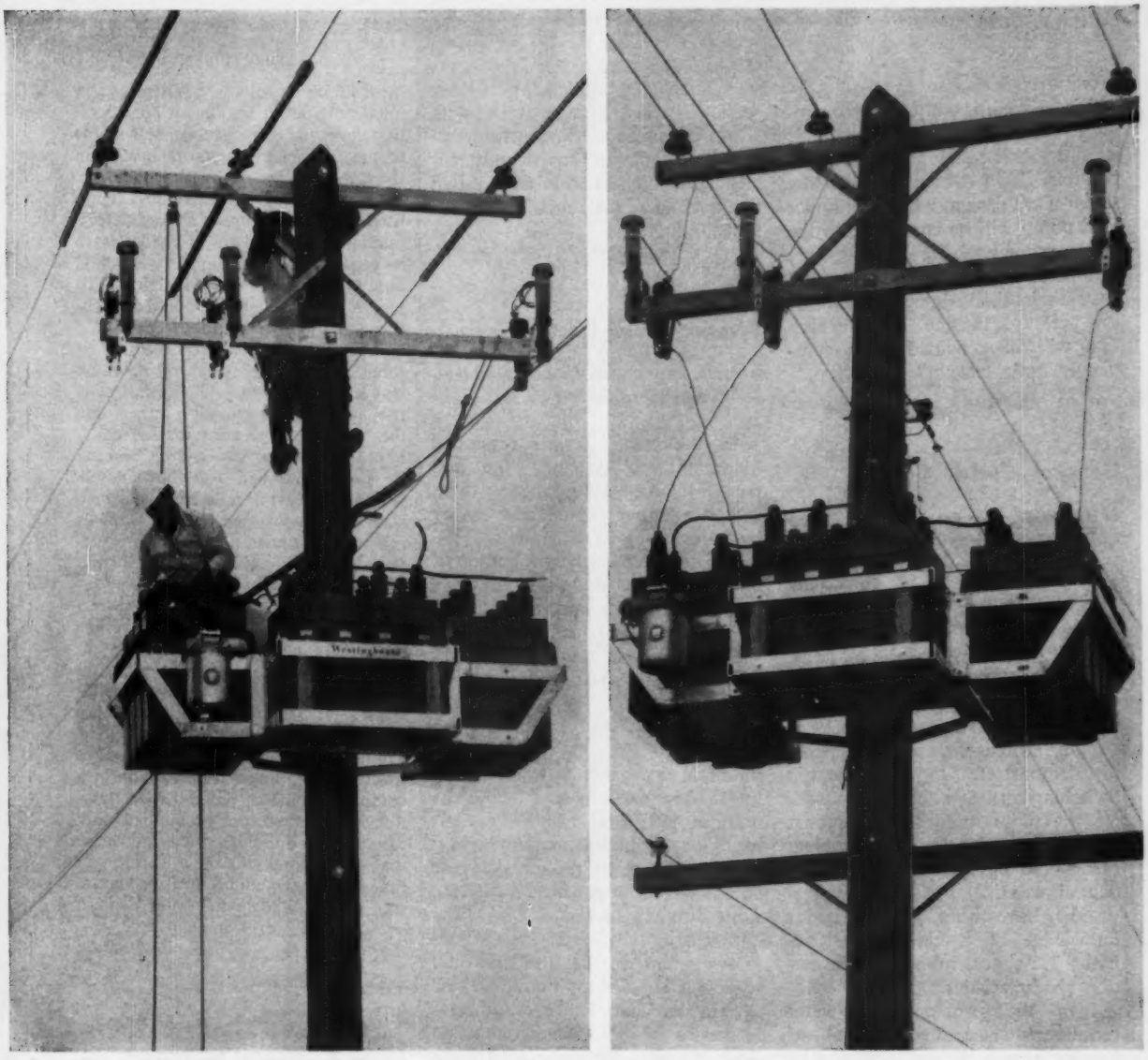


100-kvar Capacitor in 1200-kvar Autotrol

Doubles Pole-Top Capacity—Saves Space,

Lighter and more compact than previous units, the Westinghouse 100-kvar capacitor brings you new economies in complete Autotrols and stack-type equipments. You reap greater efficiencies in doubled capacities, save real dollars in pole space, installation and equipment costs.

For example, a 1200-kvar Autotrol® of these units now occupies no more pole space than a 600-kvar Autotrol of 50-kvar units. Autotrols come completely assembled and wired, ready for fast, easy installation. They are available in cluster and in-line arrangements. 100-kvar capacitors are also available in stack-type equipments for substation use.



Photos show 1200-kvar cluster-type Autotrol being installed by a Texas utility. This Autotrol consists of twelve 100-kvar Westinghouse capacitors with CSL oil switches.

Installation and Equipment Dollars

Check these Westinghouse cost-saving features:

- Fewer units with smaller dimensions mean pole space saved.
- Simple wiring and mounting in racks make field installation of banks easy.
- For stack-type installations, more compact design and greater capacity reduce number of units needed, reduce wiring, connections and fuse requirements.

Let us show you how these savings can apply to your system. Call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

You can be sure . . . if it's Westinghouse. J-61009

Westinghouse

AEIC Meets (*Continued from page 99*)

'Computer designs are now a way of life. Expansion of its use to produce working drawings in seconds is now being adopted wherever possible.'" In a compact 350-Mw steam-plant design, "the main boiler feed pump will be connected to the governor end of the high-pressure turbine shaft. Twin condensers will have their shells integral with the low-pressure turbine. The excitation will be provided by a completely static system."

General Electric Co

C. H. LINDER, Vice President and Group Executive, Electric Utility Group, General Electric Co.

"On secondary voltages, we have under consideration a 'unit residential' transformer of the oil-poor, encapsulated type for application with meters and protective equipment in each residence.

"On switchgear, we were able to demonstrate to the Electric Switching and Switchgear Committee the noise muffler development which overcomes the noise problem of air-blast breakers used near residential areas.

"We have been gaining better knowledge of insulator-string deionization times and breaker insulation characteristics.

"On the problems of water requirements, a development of interest here is the authorization by the Central Electricity Generating Board of construction of a large plant with a Heller cooling system. In this system, a finned-tube air-to-water heat exchanger will be used with a jet condenser for condenser cooling.

"With growth of water requirements estimated as reaching 453 billion gal by 1975, even the most effective conservation will make it necessary to consider processes for purifying brackish and saline water. These are potentially a very large load builder; at 10 to 30 kwhr per 1,000 gal, they may require tens of thousands of megawatts by 1975.

"On power generation, if MHD becomes economically feasible, it will likely be applied in a large scale in a topping cycle with steam generation. Engineering calculations indicate that overall efficiencies as high as 55 to 60% might be available for such combinations."

Westinghouse Electric Corp

Dr J. A. HUTCHESON, Vice President, Westinghouse Electric Corp.

In the trend toward expanded interconnected systems, "the first part of the problem is whether there is a substantial capital cost saving by going to very large units. We made a comprehensive evaluation of plant capital costs, using units as large as 800 Mw and plants up to 2,400 Mw. We concluded that we still have a long way to go before the capital savings due to larger units disappears.

"The study with Public Service Electric & Gas Co showed the optimum expansion pattern resulted in 600-Mw units in 1968, 800-Mw units in 1972 and 1,000-Mw units in 1975. It showed annual savings in the order of $1 million per year compared to a generation pattern using 500-Mw units.

"At the time this one-million-kilowatt unit would go in, it would represent 16% of the Public Service system peak load. However, in terms of the Pa.-Md.-N.J. Interconnection pool, it would represent 4% of the interconnection peak load."

In transmission, Westinghouse is working to raise transmission voltages, "reduce insulation levels for existing and future transmission voltages," and "acquire the required fundamental knowledge of switching-surge characteristics."

"We have developed a new and completely integrated dispatching system, which has as its heart a digital control computer. This is *not* a direct replacement of present dispatching equipment, but an attempt to integrate into one control facility all feasible decision-making, analytical and control functions which are associated with generation dispatch. We have several negotiations for the system underway."

Letters

(*Continued from page 5*)

most of its usefulness. Where equipment costs are a significant consideration it would certainly be reasonable to provide somewhat more insulation than that indicated by the equation.

2. The 4¢ per board ft cost figure used was based upon a contractor's quotation. No claim is made as to its generality. The examples were cited only to illustrate the principles. To regard them as general would be contrary to the purpose of the article.

3. I assume that Mr Burdick is referring to the fact that my equation was based upon the ASHRAE Guide fuel consumption equation rather than the NEMA power consumption equation. The former was chosen because it is best adapted for the analysis which considers simple heat transmission through just one sq ft of a building surface under a temperature differential determined by the climate. The ASHRAE equation gives relationships fundamental in heat transfer. The NEMA equation, on the other hand, is a useful, experience tested, somewhat empirical relationship which, in effect, recognizes the substantial contribution of various heat gains such as occupants, lighting, solar heating, etc, tending to reduce electric space heating power consumption in a complete building. The NEMA equation should therefore be applied only to complete buildings. It is my hope that readers applying the equation will take note of the addition of the square root sign printed in the letter column of *Electrical World* on October 3.

C. E. Thomas

Urge Kennedy to Move TVA's Headquarters

Three Muscle Shoals area Democratic leaders have urged President-Designate John F. Kennedy to have the Tennessee Valley Authority move its headquarters from Knoxville, Tenn., to Muscle Shoals, Ala.

The act, which created TVA, specified that the headquarters be at Muscle Shoals, but the transfer from Knoxville was never made.

The Democratic leaders who made their request in a telegram to Kennedy were Circuit Judge Clifford K. Delony, State Senator E. B. Haltom Jr, and Ed Mauldin, a delegate to the Democratic national convention.

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Several openings available for electrical engineers and designers experienced in powerplant (preferably hydro) design. Salary commensurate with experience. Please send complete resume to Personnel Manager.

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POSITIONS VACANT

Utility Electrical Engineer—for administrative headquarters of nationwide utility; must have E.E. degree, preferably with an additional business or advanced engineering degree. A minimum of 8 years of engineering, operating and administrative experience is required. Age 30-45. Salary open. Send resume of background and qualifications to: D. Olshansky, Citizens Utilities Company, Ridgeway Center, Stamford, Connecticut.

Wanted—Young Graduate Electrical Engineer not over 30. Service sales experience or inclination desired. Permanent position, top working conditions, fringe benefits. Write: Personnel Dept., S. C. Electric & Gas Co., Charleston, S. C.

SELLING OPPORTUNITY AVAILABLE

Representative wanted for manufacturer of street lighting equipment pole line specialties. Western States. Full particulars. RW-5056, Electrical World.

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Permanent positions in our St. Louis Office for qualified engineers with 2 to 10 years experience, applicable to project design of Power Plants, Missile Test Facilities, Industrial Plants, and Institutional Buildings. Work includes drawing arrangement, detail development, electric circuit and illumination calculation.

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Prompt Stock Shipment
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DO YOU GET OUR STOCK LIST?
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PENNA. TRANSFORMERS
3—each—500 K.V.A.
13,800 Volts—with Taps—to 480 volts, oil cooled. Made 1948. Also primary switch gear in cubicle and secondary switch gear available.
FS-5622, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

PSE&G Holds 'College Faculty Day'

Electrical engineering professors from four metropolitan New York colleges take a look at a data logger in Public Service Electric & Gas Co's Bergen Station as part of the utility's triennial "College Faculty Day." Shown above are (left to right) D. W. Taylor, PSE&G; and Professors F. A. Wahlers, Brooklyn Polytech; E. M. Rips, Newark College of Engineering; R. T. Weil Jr, Manhattan College; and L. R. Jacobs, Pratt Institute.

In all, 33 professors from 18 engineering colleges took part in the program, which also included inspection tours of the company's new load-dispatching center, and the new 138-26-13-kv Newark Switching Station. Lectures by Public Service engineers presented the utility's philosophy of plant design and its plans for future expansion. The program, under Chairman C. C. Ruffle, is designed to keep engineering faculties, and indirectly, their students, abreast of modern utility engineering concepts.

Buffalo Group Complains Niagara Power Too Costly

The new $725-million Niagara power development will not stimulate industrial growth in Buffalo, N. Y., unless the new power is offered to industry on more attractive terms than have been proposed, the Power Authority of the State of New York (PASNY) has been told.

The warning came from a group of Buffalo industries which complained that they are being allotted too little of the new Niagara power at too high a price. The statement was made at a public hearing on a proposed contract between PASNY and Niagara Mohawk Power Corp.

It would be a violation of Congress' intent, they charged, if the terms obstructed the growth which the project was to inspire.

The industries, through the Industrial Power Consumers Conference of Buffalo, asked for an increase of their allotted Niagara power to at least 66% and that the amount earmarked for Niagara Frontier industrial expansion be doubled. They specified that the additional expansion power be allocated to "Buffalo-type" industries.

They urged an end to the stipulation that, to get the new power, Buffalo industries must match their allotment with the conversion of an equal amount of their present 25-cycle power to 60-cycle power. These conversions, they said, would cost millions and prevent some industries from accepting even their "meager allotments."

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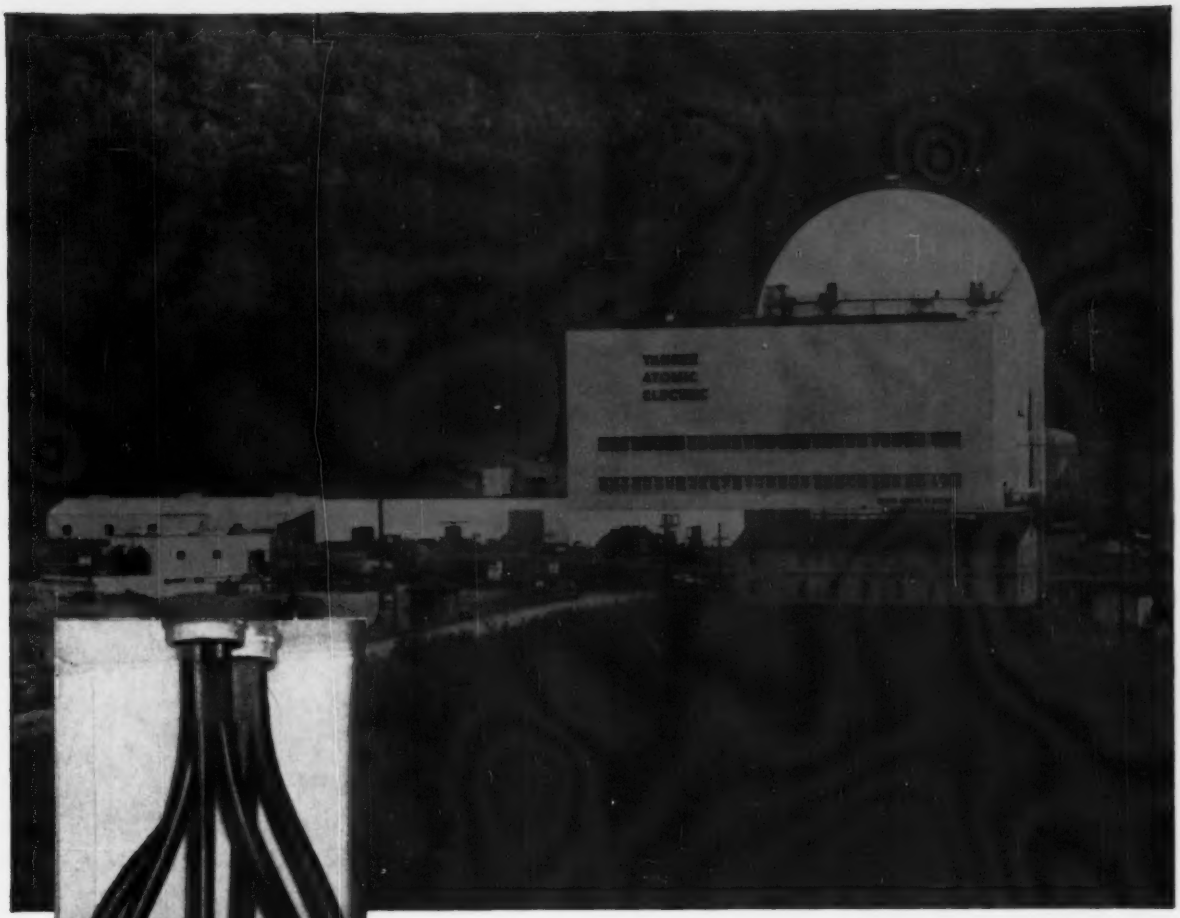

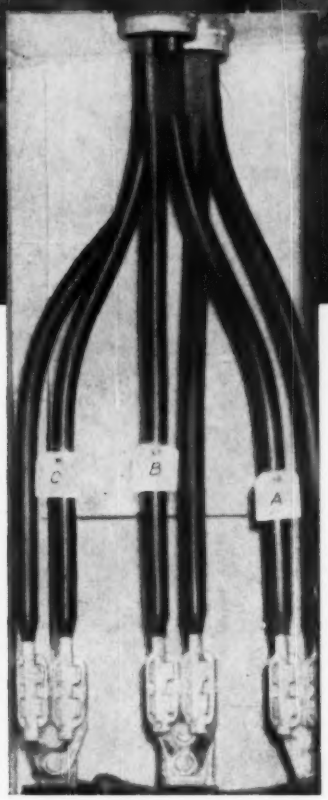

ARTERIES FOR THE POWER OF THE ATOM

In Rowe, Massachusetts, the Yankee Atomic Electric Company has built one of the first commercial atomic power plants in the U. S.

This engineering marvel, designed to transform the destructive power of the atom into useful electrical energy, utilizes no less than 200,000 feet of Simplex wire and cable, some of which is exposed to radiation.

For top performance in all types of installations, utilities and industrial companies the world over rely on the products of Simplex research and development.

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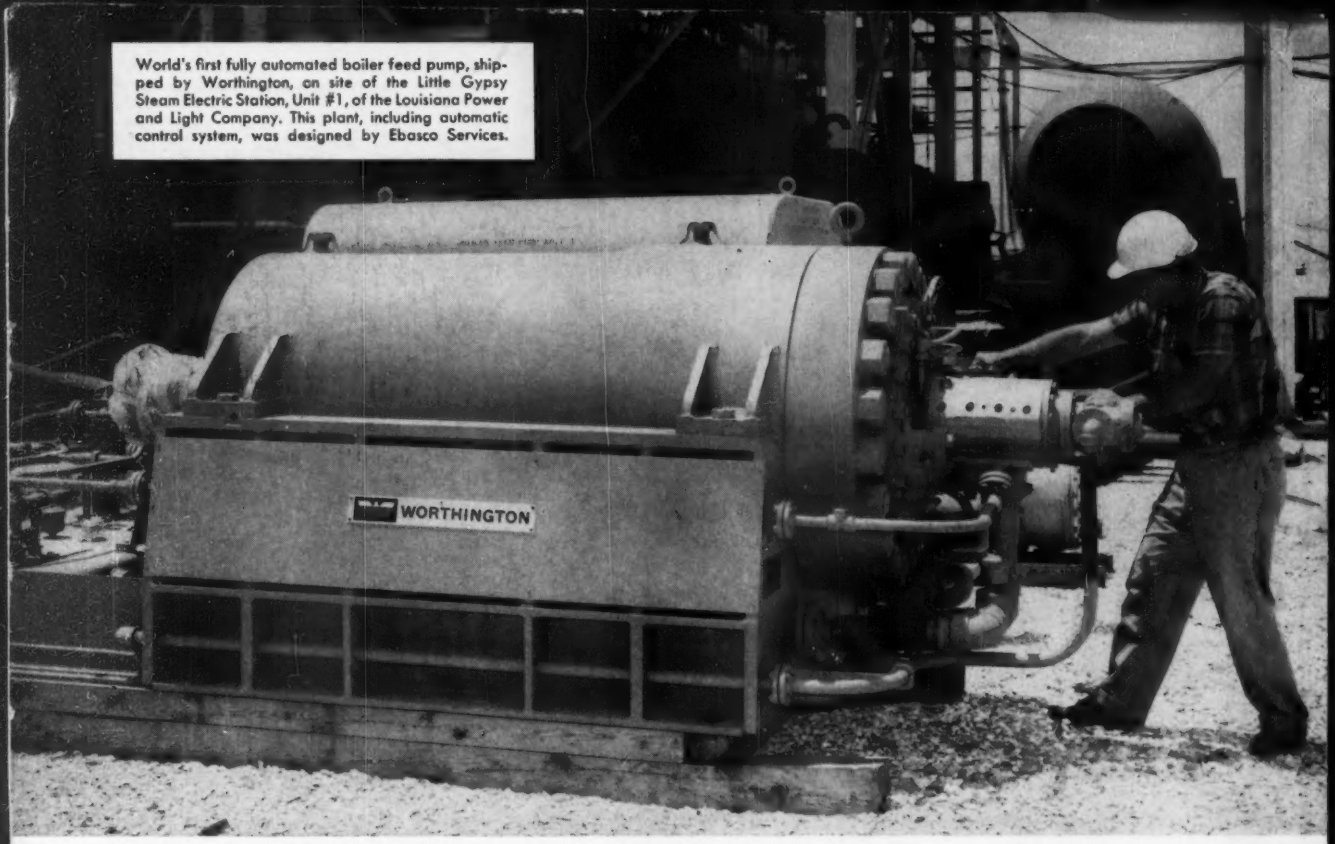
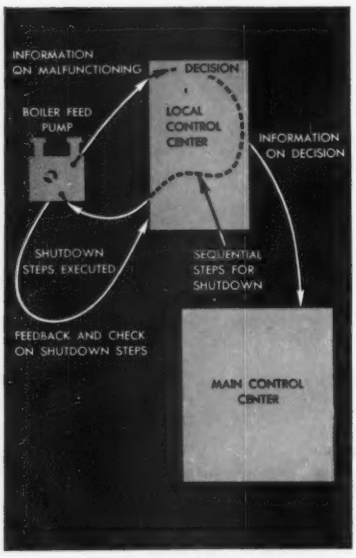


World's first fully automated boiler feed pump, shipped by Worthington, on site of the Little Gypsy Steam Electric Station, Unit #1, of the Louisiana Power and Light Company. This plant, including automatic control system, was designed by Ebasco Services.

WORTHINGTON DELIVERS THE WORLD'S FIRST FULLY AUTOMATED BOILER FEED PUMP

Should yours be next?



Automatic decisions for load variation: routine or emergency shut-down can be locally or remotely instrumented.

Frankly, we don't know. We do know, however, that we've shipped the first high-pressure boiler feed pump for a fully automated installation. Thus the "full automation" question looms bigger with each new plant.

What do we mean by "full automation," when important components have been automatically controlled for many years? We mean the use of improved equipment and instrument design and control techniques—plus modern data processing systems—in such a way that the power plant will operate continuously at optimum efficiency under varying loads, starting and stopping units as required with maximum equipment protection.

Now, is it your turn to install fully automated boiler feed pumps? Or other power plant components? That is, of course, a matter for you and your engineers to decide. But regardless of the degree of automation for which you design, we are sure that we can help you in studying the needs for instrumentation and control of the Fluid Handling Group.

Remember, we've many years in designing and building condensers and auxiliaries, generators, boiler feed pumps, compressors, turbines and control equipment. We call it "System-Wise Experience" . . . and have prepared an Automation File on Boiler Feed Pumps from it. For this file, drop a note to your Worthington District Office. Or write Worthington Corporation, Harrison, N. J.

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